

FAO FISHERIES BULLETIN

Volume 5, Number 5

September-October 1952

CONTENTS

MODERN WHALING AND ITS PROSPECTS	165
WHALE MEAT	184
RECENT FISHERIES DEVELOPMENTS IN THE MEDITERRANEAN AREA AND IN AFRICA, SOUTH OF THE SAHARA	190
FISHERIES TECHNOLOGICAL LABORATORY IN THE FAROE ISLANDS.....	195
CONFERENCES AND MEETINGS.....	196
FISHERIES DIVISION ACTIVITIES.....	200
NOTES ON FILMS.....	206
NOTES ON PUBLICATIONS.....	208

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FAO Fisheries Bulletin is prepared by the staff of the Fisheries Division and published bimonthly by the Food and Agriculture Organization of the United Nations in Rome, Italy. *FAO Fisheries Bulletin* is published in English, French and Spanish. The contents have not been copyrighted and may be reprinted freely, but reference to source will be appreciated. Annual subscription U.S. \$1.50, single copy 30 cents; rates are payable in local currencies when orders are placed through local sales agents. See inside back cover for list of sales agents.

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Printed in Italy



Figure 1. A fish stand in the market at Karachi, Pakistan.



Figure 2. The flensing deck of the *Balaena*, a British whale factory ship, in the Antarctic.

MODERN WHALING AND ITS PROSPECTS¹

When modern whaling began in the Antarctic in 1904, the world's biggest and most productive whaling field was laid open to exploitation.

Compared to the Arctic Ocean, which so far had been the chief center of whaling operations, the Antarctic Ocean covers a far greater area around the world between the pack-ice and the Antarctic convergence, situated between 50° and 60° S. Lat. The sea currents within this area furnish the surface layers with dissolved nutrients necessary for the growth of phytoplankton in such quantities that the organic production is greater there than in any other ocean.

The food chain, dissolved nutrients/phytoplankton/zooplankton/baleen whales, is short and direct, and probably nowhere in the sea can man harvest the end-product of a food chain in greater quantities or in a more concentrated form.

The average annual production of Antarctic whaling in postwar seasons has been 375,000² tons of whale oil, extracted from about 1.5 million tons of whales; this huge production will be inaccessible or unused as a source of nutrition to mankind if the whales should be exterminated or decimated to such a degree that whaling becomes unprofitable.

The preamble to the International Convention for the Regulation of Whaling, signed in Washington, D.C., U.S.A., 2 December 1946, and subsequently ratified by practically all the whaling countries of the world, states:

"Recognizing the interest of the nations of the world in safeguarding for future generations the great natural resources represented by the whale stocks;

"Considering that the history of whaling has seen overfishing of one area after another and of one species of whale after another to such a degree that it is essential to protect all species of whales from further overfishing."

Norwegian whaling companies take about 50 percent of the Antarctic catches and are, therefore, very interested in safeguarding the whale stocks as a lasting basis for an industry which is very important to Norway's national income. Norwegian initiative and inventiveness have played a great part in the development and progress of whaling

¹ By Dr. Johan T. Ruud, Professor at the University of Oslo and Director of the Institute for Whale Research, Oslo, Norway.

² Factors to convert into metric units for use in this article are: 1 foot = 0.3048 meters; 1 long ton (2,240 lb.) = 1.016047 metric tons; 1 barrel whale oil = 170 kilograms; 1 long ton whale oil = approximately 6 barrels.

and Norway feels greatly responsible for the fate of whale stocks and the future of the industry.

By international agreement the annual catch of pelagic whaling in the Antarctic is limited to 16,000 blue whale units³ or about two-thirds of the annual pre-World War II catches, but the question of further reduction in the quota is regarded as urgent.

It must be admitted, however, that it is difficult to produce evidence that will convince everyone interested that it is vitally necessary to reduce the amount of whaling, so let us consider the evidence available; first of all the historical evidence of overfishing referred to in the above quotation.

1. Historical Evidence of Overfishing of Whale Stocks

Two species of right whales used to abound in the North Atlantic and Arctic Oceans, the North Atlantic right whale and the Greenland whale or Bowhead.

Whaling for the North Atlantic right whale is believed to have begun more than a thousand years ago in the Bay of Biscay, where this species came inshore in winter for parturition. This whaling, conducted by Basques, seems to have been of importance in the 11th century. Gradually, as whales became scarce in the Bay, the Basques developed a pelagic whaling fleet, and hunted the right whale along the coasts of the British Isles, Faroe Islands, Iceland and northern Norway. The Basques were practically alone in whaling for several centuries, until whaling for the Greenland whale was taken up in Spitzbergen waters by the British in 1611. From then on the "Greenland Fishery" claimed the interest of whalers, and other nations dominated the field, first the Dutch and later the British.

In 1680, at the height of Dutch participation, there were probably 300 to 400 vessels engaged in Arctic whaling, and the catches are reported as being an average of 5 to 6 whales per ship. A hundred years later, when the British whalers, thanks to great subsidies, had taken the leading position, there were possibly as many ships whaling, but the catches had gone down to 2 to 3 whales per ship.

Whaling for the Greenland whale in the Arctic lasted 300 years. The North Atlantic right whale had long ceased to be of importance for whaling and, if not extinct, the Greenland whale became, in any practical sense of the word, exterminated in the European section of the Arctic Ocean.

It may be surprising that whaling for these two species lasted so long. The North Atlantic and Arctic Oceans could hardly support a very great stock of whales, at least nothing comparable to the stocks of blue and fin whales which have since been found in the Antarctic. The number of whales taken each year was certainly insignificant compared to the annual catches in modern whaling. Even when

³One blue whale unit is calculated as 1 blue whale or 2 fin whales, or 2½ humpbacks or 6 sei whales.

the "Greenland Fishery" was at its peak it is doubtful whether as many as 2,000 whales were taken each year.

The whaling ships of those days were small, seldom more than 300 to 400 tons, and their equipment was simple and cheap. Therefore, whaling continued to be remunerative as long as each ship took a whale or two. For this reason the stocks were depleted to such a low level that it is doubtful whether they will ever recover.

When the Dutch/British whaling came to an end, it had long since been surpassed in size and importance by the American sperm whale fishery. Begun as a modest enterprise along the New England shores, this industry spread to all the oceans of the world. Other nations participated, but the Americans dominated in this whaling, which culminated in the middle of the last century, when 729 of the approximately 1,000 vessels engaged were American (Brandt 1940).

As a consequence of the cruising for sperm whales, the southern stock of right whales was discovered, and between 1804 and 1817 an average of about 8,000 southern right whales were killed annually, chiefly in the waters around 40° S. Lat. from La Plata to South Africa and Australasia. These figures may well be compared to the annual catches of the blue and fin whales of today. The southern right whales did not stand this heavy exploitation and today are rare in the southern oceans too.

American whalers also found right whales in the North Pacific; they sailed through the Bering Straits and encountered the Bowhead in this section of the Arctic. While the right whales became completely exterminated almost everywhere, the sperm whales seemed to stand the heavy exploitation. When American sperm whaling ended recently (1924), a relatively good stock of sperm whales still existed. Nevertheless, American whaling had to end, because it was never adapted to modern techniques. The sailing vessel and the hand-harpoon could not compete with the growing industry. Sperm whaling lost capital and crews at the same time as petroleum and its by-products took the markets of sperm oil. From 1860 to the end of the century, the price of whale oil dropped from U.S.\$582 to \$164 per long ton.

II. Development of Modern Whaling

Sperm and right whales have this in common: they float in the sea when they are killed, and are relatively slow when they break surface for blowing. They could, therefore, be taken by hand-harpoon from a rowing boat.

Quite different implements are needed to tackle the bigger and quicker blue and fin whales. Svend Foyn understood this and introduced the steam-powered catcher armed with the harpoon gun. In 1868, he succeeded in catching 30 whales in Varangerfjord, north Norway.

During the subsequent 85 years, the industry has grown to dimensions previously undreamt of, and, more remarkably, has remained

a Norwegian industry in the main. This whale fishery also began as a coastal fishery. During the first 30 to 35 years it was carried on only in connection with refining plants on shore, and in this form the industry spread to all coasts, first in the North Atlantic, and then everywhere. As early as 1890 Foyn engaged in whaling from Spitzbergen and used a mothership, a sailing vessel it is true, but it was the first attempt at a floating factory in modern whaling. In 1904, the *S/S Admiralen* of 2,400 tons d.w. was fitted out as a floating factory, and had two successful seasons off Spitzbergen. Thus the instrument which made possible the expansion of whaling in the Antarctic was created; without it pelagic whaling would have been impossible. Modern whaling grew slowly; never were as many as 2,000 whales taken in a year before the turn of this century, but from then on the development gained speed. Figure 3, based on material presented in the *International Whaling Statistics* shows how the whale oil production of the world has increased since 1910 (i.e. Antarctic season 1909/10 and Arctic 1910). In that year the production was 284,000 barrels of oil extracted from 12,300 whales.

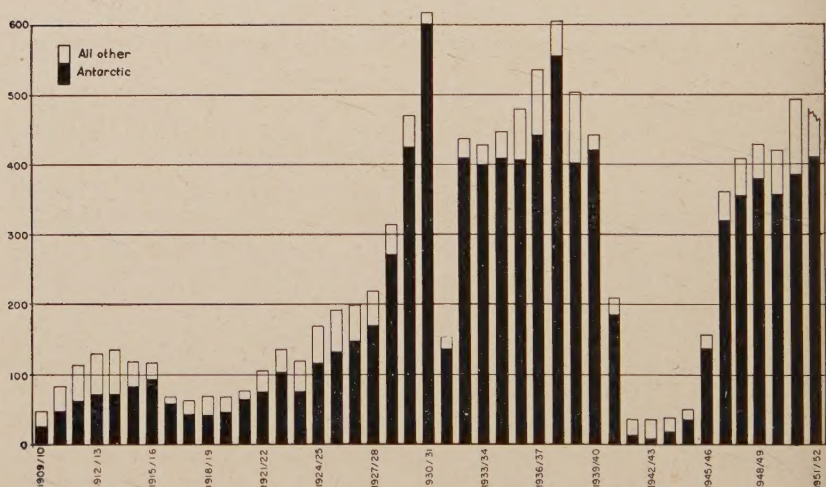


Figure 3. — Whale oil production in thousands of long tons from the Antarctic and all other areas, seasons 1909/10 to 1951/52 (incomplete).

The exploitation of new whaling grounds in the Antarctic and off the African coast was responsible for this first great expansion which culminated in 1914. Production decreased during World War I to a minimum in 1918 when it increased again, first slowly, later on like an explosion until 1931 when modern whaling reached its height with a total production of nearly 3.7 million barrels of oil from 43,129 whales. This time the increased production was due to the expansion of the industry to pelagic whaling in the Antarctic.

The market for whale oil failed, however, and Norwegian and some foreign expeditions were tied up during the season 1931/32; world production dropped to 915,000 barrels of oil.

Since 1932/33, pelagic whaling in the Antarctic has been carried on under restrictions established first by voluntary agreements between the whaling companies, and since 1937 by international agreements, signed by the interested governments.

By the voluntary restrictions from 1932/33 it was hoped to stabilize Antarctic production at about 2.5 million barrels of oil, but as Figure 3 shows, it was unsuccessful.

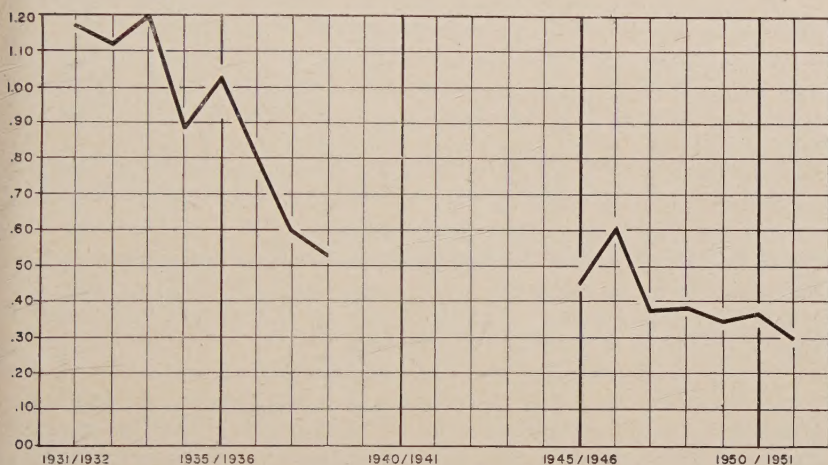


Figure 4. — Antarctic pelagic whaling average catch of blue whales per catcher's day's work.

In the following years Japan and Germany engaged in pelagic whaling and world production reached a peak of 3.6 million barrels in 1938, of which 3.3 million were produced in the Antarctic.

During World War II whaling dropped to about 200,000 barrels a year. Since the war, pelagic whaling has been regulated by international agreement and limited to 16,000 blue whale units, corresponding to about 2 million barrels of oil. Whaling in other areas has, however, increased, and the total world production is now about 3 million barrels (500,000 tons) of oil. In 1951, 55,787 whales were killed to ensure this production; this is probably the highest number of whales ever killed in the course of 12 months.

From such a summary description of the development of modern whaling, the reader may get the impression that the industry has been growing more or less continuously, interrupted only by catastrophes such as world wars and collapses of the oil market.

A breakdown of the statistics by individual whaling grounds shows that the industry has had to abandon one whaling ground after another, if not forever, at least for a long time.

III. Depletion of the Whaling Stocks of Various Grounds

Again and again the story has been repeated. From a modest beginning in a new area whaling has been expanded by the introduction of increasing numbers of catchers; the catches have reached a peak, decreased, and finally rendered the whaling unprofitable. It seems to be a common feature that the catch per boat, which is a good yard-stick for the profit of the enterprise, decreases before the total catch culminates, because for some time it is always possible to increase the latter by introducing more boats into the field.

In Icelandic waters, where modern whaling began in 1883, the catch per catcher culminated in 1895 with 48 whales per boat, but the number of boats increased from 16 in 1895 to 30 in 1902, when the total catch reached a peak of 1,305 whales, or 43 per boat. Whaling ended in 1915 with only 14 whales per boat. The Icelandic case has been studied by Hjort, Jahn and Ottestad (1933); making certain assumptions regarding the reproduction of the whales and their natural mortality, they predicted that, if left alone, the stocks of whales in Icelandic waters would approximate their original abundance by the end of the 1930s. This prediction seems to be verified, since it has been possible in recent years to resume modest whaling in Icelandic waters with good results. At present 4 modern catchers have annual returns of 60 to 80 whales per boat.

In the above example, the number of whales, irrespective of the species, is given, since the specification is incomplete in the statistics on the early years of modern whaling. It is evident that in an area where two or more species are regularly taken it is possible to deplete the stocks of one or two important species nearly to extinction, because it may be that while catching other species on which the industry can still make a profit, other whales will be taken in the course of operations. A good example is offered by the whaling for humpbacks off South Georgia in the early decades of this century. Whaling operations began in the season 1904/05 with one boat, which took 180 humpbacks, 11 blue whales and 4 fin whales. More companies and more catchers were engaged in the enterprise, and the fate of the humpback is shown in Table 1.

TABLE 1 — TOTAL CATCH AND CATCH PER BOAT OF HUMPBACK WHALES FROM SOUTH GEORGIA, SEASONS 1904/05 TO 1917/18

Season	No.	No. Per Boat	Season	No.	No. Per Boat
1904/05.....	180	180.0	1911/12.....	5 311	252.9
1905/06.....	288	144.0	1912/13.....	2 291	109.1
1906/07.....	240	120.0	1913/14.....	563	26.8
1907/08.....	1 281	183.0	1914/15.....	823	37.4
1908/09.....	1 841	230.1	1915/16.....	1 578	56.4
1909/10.....	3 391	199.5	1916/17.....	378	11.8
1910/11.....	6 197	326.2	1917/18.....	60	1.9

During the 1917/18 season, 60 humpbacks, 1.9 percent of the total catch, were taken, and the catch of humpbacks from South Georgia has been insignificant since. The catch of blue and fin whales has continued uninterruptedly, and the humpbacks have in part been protected and left alone, but the stock does not seem to have increased appreciably.

The whaling grounds in which a single species is subject to catch give us the best opportunity to study how this stock of whales is depleted by attack. If whaling operations are taken up again after some time, it is possible to get an idea of how the stock has been restored during the time it was left alone.

Again, the best examples are offered by the history of humpback whaling, this time in tropical seas, off the coasts of the Congo and Western Australia. Both these areas are well-known as whaling grounds for humpbacks; even during the American era of the old whale fishery they were exploited to some extent. Modern whaling began off the Congo and Western Australia in 1921, and its development has proceeded as shown in the table below.

TABLE 2 — STATISTICS ON HUMPBACK WHALING OFF THE CONGO AND WESTERN AUSTRALIA

Year	C o n g o			Western Australia		
	Total Hump-backs	Catchers No.	Hump-backs per Catcher	Total Hump-backs	Catchers No.	Hump-backs per Catcher
1912	418	3	139	592	11	54
1913	2 522	19	133	1 341	9	149
1914	1 760	23	76	1 968	8	246
1915	...	...	...	1 430	10	143
1916	...	...	...	(470)	4	(118)
1922	613	4	153	...	...	...
1923	685	5	137	...	...	...
1924	519	6	86	...	...	...
1925	756	15	50	669	3	223
1926	321	6	53	735	3	245
1927	...	...	...	996	4	249
1928	...	...	...	1 033	4	258
1929	...	...	...	...	...	...
1930	586	6	98	...	...	...
1934	724	4	181	...	...	...
1935	1 241	10	124	...	...	...
1936	840	11	76	3 072	12	256
1937	298	4	75	3 242	14	233
1938	...	...	...	917	6	153
1947	...	...	...	2	1	2
1948	...	...	...	4	1	4
1949	1 356	8	167	193	2	96
1950	1 404	7	201	388	4	97
1951	1 105	14	79	1 224	6	204

¹The *International Whaling Statistics* (Vol. 16, 1942) show 394 humpbacks and 5 catchers in the season 1924, but there exist statistics of 519 humpbacks taken off the Congo (*Norwegian Whaling Gazette*, 1925, p. 32).

Excluding the 1930 season, there have been, off the Congo as off Western Australia, four periods of whaling, 1912-1916, 1922-1928,

1934-1938, 1949 to date. They have lasted from 3 to 5 years and were interrupted by periods of 7 to 12 years during which the humpbacks were left alone.

Each whaling period off the Congo has rendered 2 good seasons, with catches of from 124 to 201 humpbacks per catcher. The third season showed declining catches, 75 to 86 humpbacks per boat, and in 1914, 1926 and 1937 whaling was abandoned as unprofitable. When whaling ended off the Congo in 1914, 4,700 humpbacks in all had been taken, and during the second and third whaling periods, 2,894 and 3,103 humpbacks respectively. So far, 3,865 humpbacks have been taken in the present period (1951).⁴

Although begun on an accumulated stock, whaling became unprofitable in 1914 after a catch of 4,700 humpbacks. There is reason to believe, however, that the same stock was exploited off Angola, where about 10,000 humpbacks were taken in 5 seasons from 1910 to 1914. A reasonable catch of blue and fin whales made it profitable to carry on, even if the catch of humpbacks dropped to 21 per catcher. In this case, therefore, the humpbacks had been hit too hard, and when whaling was resumed off Angola in the 1920s, only insignificant catches of humpbacks were made.

The history of humpback whaling off Western Australia is a little different. Here the first period lasted for 5 seasons and the catches culminated in 1914 with 246 humpbacks per catcher. The catches declined in the following seasons and in 1916 were less than 118 per catcher. (The total catch is not specified and includes some sperm whales). When this period ended, 5,800 humpbacks had been taken.

Nine years later, in 1925, whaling was resumed on a modest scale and continued until 1928, when 258 humpbacks per catcher were taken. When whaling ended this time, the total catch of the period had been 3,433 humpbacks, and no signs of decline in the stock were seen. After an interval of 7 years, whaling was resumed for the third time, this time with 2 floating factories and 12 catchers. Now the stock was overfished. In the course of two seasons, 6,314 humpbacks were killed. In the third season catches declined to 153 humpbacks per catcher, and operations ceased until 1949, when whaling was resumed under strict control of the Australian whaling commission.

The history of humpback whaling off the Congo and Western Australia demonstrates in a convincing manner that if this stock of whales has not been depleted too far and it is left alone for a period of years, it has the ability to increase again to a level which again renders whaling profitable. The experience gained from the second period of Australian whaling seems to imply that an industry of modest dimensions may be kept going continuously, if properly regulated and conducted.

Three thousand humpbacks per year, as taken in 1936 and 1937, certainly means overfishing of the Western Australian stock, espec-

⁴1952 catches so far (August) have been very poor.

ially when the same stock is exploited in the Antarctic, as in the 1930s.

Humpbacks were protected from pelagic whaling in the Antarctic from 1938 to 1949. At present 1,250 humpbacks are taken according to international regulations, most of them in the waters around Kerguelen where the Western Australian humpbacks, as shown by marking experiments, have their summer migration. In Western Australian waters, the Australian Whaling Commission allows an annual catch of 1,250 humpbacks also, so that 2,000 to 2,500 whales per year may be taken of this stock. Time will soon show if this amount also means overfishing.

Repeated experience shows that 1,000 to 1,500 humpbacks a year means overfishing of the West African stock. This stock therefore, must be rather weak at present, a conclusion corroborated by the fact that humpbacks are scarce in that part of the Antarctic Ocean where the West African stock would be expected to migrate in summer, that is, to the waters around Bouvet Island.

There is also a possibility, which must be taken into account, that the terrible slaughter of humpbacks conducted off South Georgia hit just the same stock as the fishing off Angola. In that case we may assume that the stock of humpbacks in West African waters has never recovered to anything like the original total. The intervals in which it has been left alone for regeneration have been too short.

IV. Depletion in the Antarctic Stocks of Blue and Fin Whales

CHANGES IN THE CATCH PER UNIT OF EFFORT

Today 80 percent of the total annual production of whale oil comes from pelagic whaling in the Antarctic. Before World War II more than 90 percent of all whales taken in pelagic whaling were blue and fin whales; today they form about 80 percent of the catches, the remaining 20 percent being humpbacks and sperm whales. In other words, it is the stocks of blue and fin whales that carry the burden of Antarctic pelagic whaling, and the industry will end in economic disaster if these stocks are overfished and depleted.

Table 3 compares data concerning pelagic whaling in the Antarctic in two widely different seasons, 1933/34 and 1950/51. These seasons were chosen because they were the last on which full information is available on catch returns per selected work unit (*International Whaling Statistics*, Vol. 28, 1952).

Nineteen floating factories operated in the Antarctic in both seasons. The very best and biggest factories had been selected from the world's fleet of about 40 in 1933/34, so they may well be compared to the factory ships of today with regard to design, size and equipment for handling the carcasses.

The processing plant has been improved, however, and modern factory ships have a higher productive capacity. They are able to treat more raw material per day when catches are high than the factories of 1933/34.

TABLE 3 — SELECTED DATA CONCERNING PELAGIC WHALING IN THE ANTARCTIC, SEASONS 1933/34 AND 1950/51

	1933/34	1950/51
1. Number of floating factories	19	19
Average tonnage of floating factories	12 559	14 297
Number of catchers in operation	114	241
Average tonnage of catchers	256	453
Average engine power, i. h. p.	880	1 825
2. Total production of baleen whale oil in barrels.....	2 225 663	1 909 640
Oil production per floating factory in barrels.....	117 140	100 507
Oil production per catcher in barrels.....	19 523	7 924
3. Average number of days in whaling seasons	112	78
Total number of catcher's day's work.....	13 967	18 750
4. Total number of catch : Blue whales	16 813	6 966
Fin whales	5 472	17 474
Humpbacks	780	1 630
Other whales (sperm).	659	5 120
Total catch in calculated blue whale units.....	19 861	16 416
5. Catch by numbers, per catcher's day's work :		
Blue whales	1.20	0.37
Fin whales	0.39	0.93
Blue whale units.....	1.42	0.88
Barrels of oil.....	159	102

With regard to the catchers attached to the expeditions, the two seasons were very different. The numbers are now more than doubled, having increased from a total of 114 to 241, and the catchers of 1950/51 were nearly twice as big in tonnage and engine power as the boats of 1933/34, although the latter were selected boats for their time. Some of them were new, the others had been taken from among the 200 operating in 1930/31.

Oil production was approximately the same in the two seasons, a total of 2.2 and 1.9 million barrels, or a good 100,000 barrels per expedition. While the catchers in 1933/34 procured raw materials for nearly 20,000 barrels, the boats in 1950/51 barely managed an average of 8,000 barrels.

These are important facts for an evaluation of the economic results of present day whaling. In this connection it is of minor importance that the season was of much shorter duration in 1950/51 than in 1933/34.

To get an idea of how the possibilities for whaling have changed and grown worse from 1933/34 to 1950/51, the different lengths of the seasons must be taken into consideration and the results per day of operation compared. A suitable unit for the effort displayed seems to be the *catcher's day's work*, although it is self-evident that the catcher's day's work of 1933/34 was a smaller unit than that of 1950/51.

The boats of today can operate in worse weather than the old ones could, and have higher chasing and towing speeds.

On the other hand, it may be presumed that the gunners and crews of 1933/34 as an average were as efficient as were those of 1950/51, since they consisted of the pick of the great number engaged in whaling a few seasons earlier. Today the demand for gunners crews is much greater and there may be a shortage of the very good ones.

All things considered, the catcher's day's work is the best unit available for a standard for the amount of work and effort put into the catching operations.

Table 3 shows that the total number of a catcher's day's work increased by 34 percent from 1933/34 to 1950/51. To judge the economy of the operations, it is important to remember that the output of oil per catcher's day's work decreased considerably, namely from 159 to 102 barrels. It must be presumed that if the boats had been identical in the two seasons, the decrease would have been even greater.

The oil production of 1933/34 was sold at a price of £10 to £12 per long ton, that of 1950/51 at £100 or more, and the industry's income was excellent; but since the costs of operation have reached such a high level the margin of profit is narrow.

The high price of whale oil and the regulations adopted by international agreement have stimulated postwar development. The competition for the highest possible share of 16,000 blue whale units has led to increased efforts, namely more and bigger catches, and consequently, increasing costs of operation.

One of the larger Norwegian expeditions today has a budget of expenditure of about N.Kr.25,000,000, that is, £1,250,000. An appreciable amount of the oil produced by Norwegian companies in 1951/52 is sold at £72.10.0d per ton, which means that a production of 105,000 barrels will just balance the budget. Last season's average production was 108,000 barrels per expedition. Many expeditions therefore, will, have their limit of remunerative operations at a price £70 around per long ton.

COMPOSITION OF THE CATCHES BY SPECIES

All species of baleen whales can be utilized by the industry as raw material, and count in production according to their size and fat content. Long experience shows that one blue whale gives about the same output of oil as 2 fin whales, or 2½ humpbacks or 6 sei whales. For this reason, the concept a "blue whale unit" has been adopted in the whaling industry. Sperm whales are not calculated into blue whale units, since sperm oil has qualities very different from baleen whale oil.

In a technical sense the stock of whales in the Antarctic may be considered as a unit, irrespective of species involved, although blue, fin, humpback and sei whales are not all equivalent in the relations

1:2:2.5:6 when we consider them as objects to catch. A certain amount of selection of species is pertinent to all whaling operations. The relation between the different species in the catches does not reflect, therefore, the actual relative abundance of these species in the sea, and it is very difficult to get any valid information on this last point.

Based on observations from the research vessels *Discovery II* and *William Scoresby*, N.A. Mackintosh (1942) estimated the relation between blue, fin and humpback whales before the last war as 10 to 20 percent blue, 65 to 85 percent fin and 5 to 15 percent humpbacks. This estimate is for the whole Antarctic ocean; in the different areas the relations vary widely. It cannot in any case be doubted that fin whales are, and always have been, many times more abundant than blue whales.

From Table 3 (Sections 4 and 5) it is seen, that the relations between blue and fin whales *in the catches* has changed completely in the period covered by the table. Of the total number of blue and fin whales taken in 1933/34, 75.4 percent were blue whales. In 1950/51, the relation was inverted, 71.9 percent were fin whales. In 1933/34, 1.2 blue whales were taken per catcher's day's work, and in 1950/51 only 0.37.

When we consider the preference given to blue whales in catching operations, this can only mean that blue whales have become much scarcer on the whaling ground than they used to be, and the boats have sought compensation in an increased catch of the species rated second, the fin whales. But, complete compensation has not been achieved. In 1933/34, there were taken 1.42 blue whale units per catcher's day's work, in 1950/51 only 0.88, a decrease of 38 percent.

To a biologist it seems unfortunate that the international convention for the regulation of whaling does not accept the full consequence of the fact that blue whales are in danger of depletion much more than fin whales and therefore are in as much need of separate measures of protection as are the humpbacks. Of the 16,000 blue whale units which can now be taken by pelagic expeditions in the Antarctic, 500 units can be filled by the catch of 1,250 humpbacks, the rest by the indiscriminate catching of blue and fin whales, just as they appear on the grounds.

The relation between blue and fin whales in the catches will depend, therefore, on the relation between them on the grounds modified to some extent by possible selection. As the possibilities for selection are diminished, the catches will more and more reflect the actual relations between the species in the sea. It must be kept in mind, however, that the relation between the species varies with location and time.

During many seasons it has been ascertained that blue whales are relatively more abundant in catches taken in the waters to the east of Bouvet Island rather than to the west. In previous seasons, when whaling was conducted in October, November and December as well as from January to March, it was established that everywhere blue

whales were predominant in the catches before the New Year, while fin whales increased in importance as the season advanced. Another point of interest, which may influence the composition of species in the catches, is the tendency in recent seasons to operate more in open waters than within the pack-ice zone.

It may be objected, therefore, that the great change in the relative importance of blue and fin whales, which has taken place since the 1933/34 season, is a consequence of the regulations which forbid whaling in the earlier part of the season, at present before 2 January, and furthermore, that the varying activity in the different areas of the Antarctic will influence the relative catch of the species in question.

It must be admitted that one of the points gained by opening the season as late as possible is that the taxation of blue whales is diminished, while that of fin whales is increased. Another point, and the important one in this connection, is that all species of whales fatten as the season advances and will give the highest yields of oil when taken late in the season.

Thus, by closing the early part of the season, the International Convention has intentionally brought down the relative catches of blue whales, but this fact can, as the table below will show, explain only a part of the decrease.

TABLE 4 — PERCENTAGE OF BLUE WHALES IN MONTHLY TOTAL CATCHES OF PELAGIC WHALING IN THE ANTARCTIC

Months	S e a s o n				
	1933/34	1938/39	1945/46	1948/49	1950/51
October.....	92.6	...	...	...	...
November.....	90.2	62.5	36.2	...	...
December.....	84.6	50.5	51.2	36.2	...
January.....	56.3	38.8	32.2	26.5	26.4
February.....	45.7	23.7	32.1	23.5	22.6
March.....	50.7	23.5	19.6	22.9	...

Source : Norwegian Whaling Gazette, March 1950, p. 108
 International Whaling Statistics, Vol. 28 Table h.

If we compare the percentage of blue whales in the catches of January and February during the several seasons, a marked decrease is still evident. This decrease can only be fully explained by a decrease in the abundance of blue whales relative to the other species of importance. It is also true that the whaling activities in the different areas have varied from season to season, but also, it is an established fact that within each separate statistical area there is a decrease in the percentage of blue whales in the catches (Bergersen and Ruud, 1941, p. 20).

In the whaling ground from Greenwich meridian westwards to 60° W. Long. (known as Area II, f.i.), the percentage of blue whales decreased from 67.7 in 1929/30 to 39.2 in 1938/39 and has decreased further since the war to 18.8 in 1950/51. In the area from Greenwich eastwards to 70° E. Long. (Area III), the percentage fell from 91.1 in 1929/30 to 34.0 in 1938/39 and to 20.0 percent in 1950/51; similar decreases are evident in the other areas.

The varying intensity of whaling in the different areas can, therefore, only modify a trend which is apparent in the development from all parts of the Antarctic, and blue whales will continue to decrease in relative abundance.

The decrease in the average catch of blue whales per catcher's day's work, as shown in Figure 2, reflects, therefore, a reality of grave significance that the stocks of blue whales in the Antarctic have gradually been depleted to an alarming extent.

CHANGES IN THE SIZE COMPOSITION OF WHALES IN THE CATCHES

The increased death rate which whaling operations introduce into the stocks of whales will lead to decreasing average ages and lengths and this development will be reflected in the catches.

So far there is no dependable or exact method for the age determination of the individual whale to permit age analysis of the catches on a scale large enough to follow the changes in the age composition, which takes place from time to time and under the varying conditions of toll taken.

However, their lengths are, within limits, related to their ages, and the composition of the catches as regards individual size has been kept under observation in an attempt to follow the influence of whaling operations on the stocks.

Figure 5, based on information in the *International Whaling Statistics*, Vols. 4, 16, 28, illustrates how the average lengths of blue and fin whales taken by pelagic expeditions have changed since the season 1931/32.

In that season the majority of floating factories were laid up; only five expeditions operated in the Antarctic and were thus able to pick the biggest whales. In no other season have the captured blue and fin whales attained average lengths as great as in 1931/32. This season was exceptional, therefore, but the results were interesting as showing the size composition of the catch which it was possible to select in those days when whaling operations were reduced to modest dimensions, from 32,242 whales in 1930/31 to 7,367 whales in 1931/32.

The comparison of later seasons with that of 1931/32 gains in interest when it is considered that the same number of blue whales was taken in this as in most of the seasons after World War II.

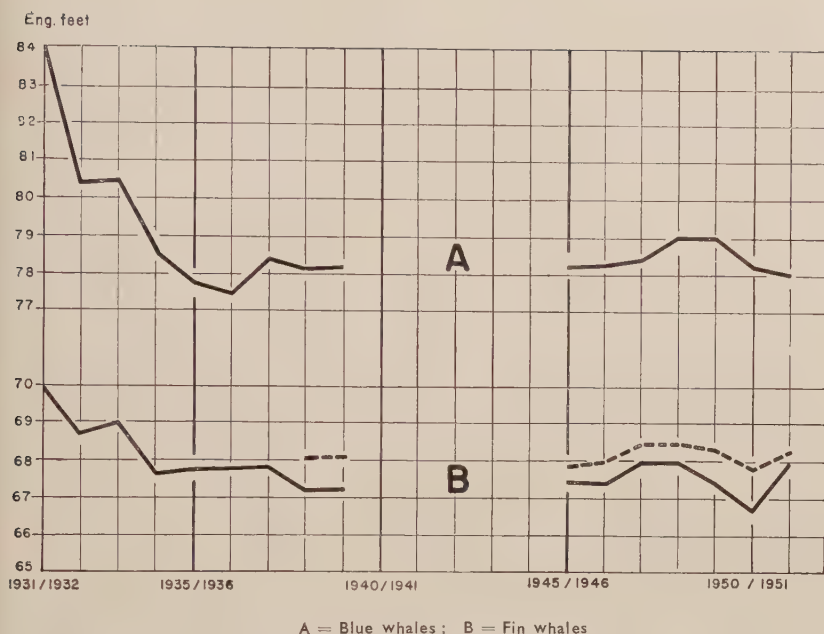


Figure 5. — Antarctic pelagic whaling average lengths of whales caught in the seasons 1931/32 to 1951/52.

The average length of blue whales decreased quickly until the 1936/37 season, when a minimum of $77\frac{1}{2}$ English feet was attained, that is, 78.77 feet for females and 76.29 feet for males. It is worth observing that these lengths are only slightly greater than the mean lengths at which blue whales attain sexual maturity, that is, 77 feet for females and 74 feet for males (Mackintosh 1942). These lengths are often used for a division into "immature" and "mature whales," and it has been demonstrated that the decreasing average lengths are accompanied by increasing percentages of "immature whales" in the catches.

In 1936/37, this percentage was 33.39 for blue whales, that is, one-third of the blue whales taken were, on an average, sexually immature. When to this is added the unknown number of mature females in their first season which had not yet reproduced, it must be admitted that the situation was serious for the restoration of the stock.

Stabilization seemed to occur in the blue whale stock in the last seasons before World War II. The average length varied around 78 feet and the percentage of immature whales around 30. However, as Figure 4 shows, the catches of blue whales per catcher's day's work continued to decrease, and it must be concluded that the stock did too. The apparent stabilization in size composition means probably that a balance was attained, a balance determined by the growth

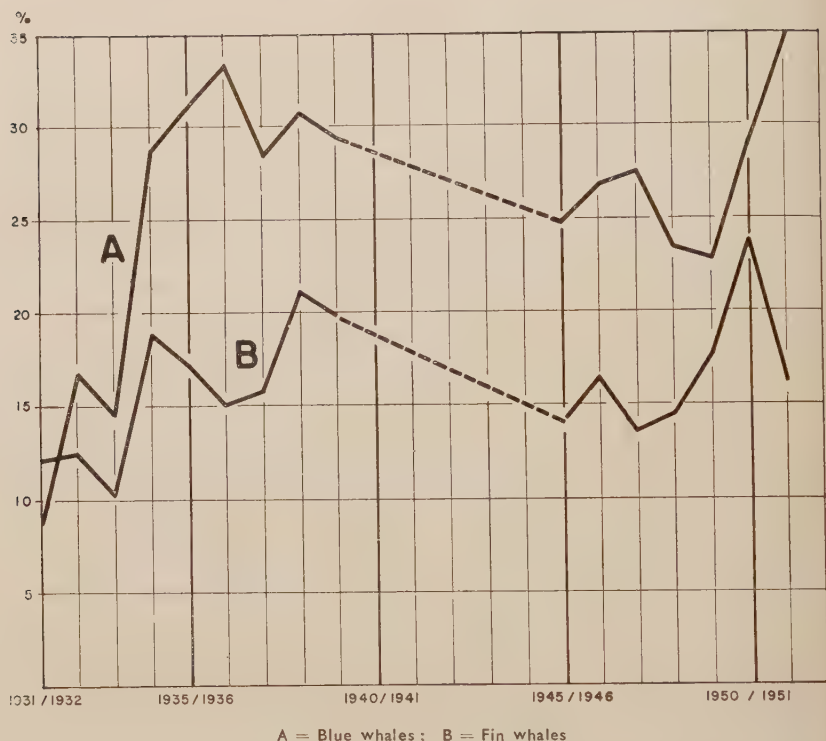


Figure 6. — Antarctic pelagic whaling percentage of immature whale sin catches.

rate and the minimum size of 70 feet in force for legal catches of blue whales. If that be so, it must be assumed that all sizes of blue whales above 70 feet were subject to the same relative taxation, which again means that a possibility of selection no longer existed for this species.

During World War II whaling in the Antarctic was conducted in a limited area and to a limited extent. However, when whaling was resumed in 1945/46, the catches, particularly of blue whales, were disappointing. There were few signs that the blue whales had increased in numbers. However, the size composition had changed in an interesting manner. The average lengths were about the same as before the war for blue and fin whales, but the percentage of immature whales in the catches had decreased. This could only mean that medium-sized sexually mature whales were relatively more abundant in the catches and in the stocks than before the war. This might be explained if the year-classes born during the war years were relatively more numerous than the older classes in the stocks.

After the experience of 1945/46 we could foresee that the average lengths would increase in the following seasons, and this development

would continue until the year-classes of the war had been exhausted and no longer were of significance for the size composition.

As Figure 5 shows, the average length of blue whales increased up to and including the season 1949/50, while that of fin whales attained its maximum the season before. In the last two seasons the average length of blue whales has declined to prewar level, and the percentage of immature whales has increased to about 30 again. Thus we are back to the prewar "normal" conditions in the size composition of this species.

For fin whales the minimum length of legal catches was changed from 55 to 60 feet for last season, which accounts for the rise in the average length from 1950/51 to 1951/52. The broken line in Figure 5 shows the average lengths, if whales of less than 60 feet are excluded from the statistical material of previous seasons.

The minimum length of 55 feet for the legal catch of fin whales, in force up to last season, was comparatively much lower than the minimum length of 70 feet for blue whales, and a substantially greater proportion of immature fin whales than of blue whales could, therefore, be taken without infringement of the regulations.

Immature fin whales never exceeded 21 percent of the catches before the war, and only as late as 1950/51 did the percentage climb to 24 (See Figure 6). This fact may mean that the stock of fin whales is still in such good condition that the smallest whales can easily be avoided by gunners, but it may also mean that segregation takes place among fin whales so that the youngest individuals do not migrate to the more southerly Antarctic latitudes to the same extent as the older ones.

V. Conclusions Concerning the Depletion of the Antarctic Whale Stocks

The experiences of 25 years of Antarctic pelagic whaling, briefly reported upon above, seem to justify, beyond doubt, the statement that the numbers of whales taken in these waters before the war, i. e. 30,000 to 40,000 whales or 20,000 to 28,000 blue whale units per season, were far too high. The decrease in the catches per catcher's day's work, as well as in average lengths, and the increase in the relative catches of immature whales are all evidence of a decreasing stock.

By limiting the annual catch to 16,000 blue whale units, as enforced by international agreement, the previous amount is reduced by one-third. In this way it is hoped that further decreases in stocks will be retarded, if not completely checked. This regulation has now been in force since World War II, and as Table 5 shows, has allowed the procurement of about the same amount of oil or the same number of blue whale units per catcher's day's work as in 1938/39. Even if constant improvements in the whaling vessels may hide and counter-balance decreasing tendencies, there seem to be good reasons for the statement that, in a technical sense, the regulation has been very successful.

TABLE 5 — AVERAGE OIL PRODUCTION AND AVERAGE CATCH IN BLUE WHALE UNITS PER CATCHER'S DAY'S WORK IN ANTARCTIC PELAGIC WHALING

Season	Output per Catcher's Day's Work	
	Barrels of Oil	Blue Whale Units
1938/39.....	98	0.92
1945/46.....	95	0.96
1946/47.....	118	1.05
1947/48.....	100	0.91
1948/49.....	98	0.85
1949/50.....	106	0.90
1950/51.....	102	0.88
1951/52.....	121	0.94
	Postwar mean: 105.7	Postwar mean: 0.92

Source : Material presented by the Norwegian Delegation to the International Whaling Commission, June 1952.

A biologist, however, must view with grave concern the evidence given above of a constantly shrinking blue whale stock. Even if the decrease in actual catches, as shown by Figure 4, is due in part to the regulation's late date for opening the season, it must be confessed that other signs of depletion, such as decreased average length and the increased catches of immature whales, fill us with anxiety for the future of the blue whale fishery.

When one-third or more of the whales taken are immature, it must mean a danger to the recruitment of the stock. In my opinion it cannot be doubted that the blue whales in the Antarctic are in need of further protection.

As mentioned above, there is reason to believe that the stock of fin whales is several times greater than that of blue whales. It is known, however, that for 12 seasons before the war an average catch of 15,434 blue whales annually was far too much. In five postwar seasons, a yearly average of 18,451 fin whales were taken, and during the last season even more than 20,000.

It may be doubted that the stock of fin whales can sustain such heavy taxation in the long run. Certainly there are signs of depletion, decreasing average length, and increasing percentages of immature whales in the catches. The higher minimum length for fin whales was introduced last season as a counter-agent to this unfortunate development.

Under these circumstances I think it only fair to warn against any regulation that brings about an ever increasing catch of fin whales as the blue whale catches fail. With a lasting industry in mind the wise and only advisable way is a further reduction of the total quota of blue whale units combined with separate measures for protection of blue whales as well as of humpbacks.

In pelagic whaling the raw material goes, practically speaking, only to the processing of whale oil; it may be questioned whether this is the best utilization.

Sixteen thousand blue whale units provide about 1.3 million tons of raw material which, according to Ash (1952) can, roughly be calculated to consist of the following:

335000 tons of blubber

235000 tons of bone

550000 tons of meat

180000 tons of internal organs, etc.

The most important content of the blubber is fat, but the bones also contain appreciable amounts of fat as well as an average of 13 to 14 percent phosphorous (calculated as P_2O_5). At present the total Antarctic (land stations included) production of whale meal from meat and bones amounts to 26,000 tons per year and only about 30,000 tons of meat are retained for human or animal consumption, chiefly in Japan. Very appreciable amounts of phosphorus and proteins are, therefore, thrown back into the sea as waste products.

No doubt one might easily bring to market one or two hundred thousand tons of edible whale meat, which would add substantially to the protein food of man in many undernourished countries. The efforts of British companies to introduce whale meat for human consumption on the home market have largely been a failure. Two to four thousand tons of whale meat for dog food have been the total British imports from the Antarctic in recent seasons.

It is beyond the scope of this article to discuss the many difficulties involved in obtaining the most useful products from whales. The industry itself is greatly interested and has invested large sums in research work on new by-products of various kinds, so far with no outstanding results. The oil yield has been considerably improved, however, thanks to new technical equipment, but under present whaling conditions there seems to be little prospect of an important extension in the utilization of the raw material.

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WHALE MEAT

A Potential Protein Food Resource

Forty-five thousand whales were caught all over the world in 1950 totaling more than two million metric tons, and about 50 percent of that weight was meat. This is approximately the amount of whale meat that is drawn from the ocean every year.

However, whales are not hunted for their meat. It is tempting to say "on the contrary." Whale meat is only a by-product of the whaling industry and for many years was considered in most places as a rather valueless by-product, or at least so troublesome that millions of tons were actually discarded, literally thrown back into the ocean. Some meat is used directly in the feeding of fur animals, but the total weight is small. A larger amount is converted into whale meal, either on floating factories or shore stations. The world production of meal from whale meat was 25,800 metric tons in 1951, probably representing about 115,000 tons of fresh meat. This production might, however, be based on the non-edible parts of the whale meat.

In a few countries, primarily Japan, parts of the population are accustomed to eating whale meat. Aboard whaling ships and near shore stations fresh whale meat has been eaten in small amounts for a long time. In recent years some 10,000 tons of whale meat have been frozen and canned annually for human consumption in countries such as Canada, Iceland, Norway and the United Kingdom.

So it is nothing new that at least some of the whale meat can be eaten. The news is that an increasing number of investigations are now being carried out in order to establish the nutritive values of whale meat and how it can be preserved most economically so that it can come into the reach of people who need such protein food supplement.

This increasing interest in making whale meat available to more people undoubtedly is due to the increasing understanding that in this world of undernourishment there is no room for continually wasting such considerable quantities of food.

It should be stressed that the work involved in properly preserving the whale meat, especially aboard whaling ships, has been unprofitable. However, it is to be hoped that technological and economic problems in the preservation of whale meat will be solved, so that an increasing percentage of this potential protein source will be utilized for human consumption.

Table 1 gives an idea of the nutritive value of edible whale meat. There is still only little information found in the literature on the biological value of the proteins of whale meat. It will be noticed from the table that whale meat has a remarkably high content of

TABLE 1 — COMPOSITION OF WHALE MEAT

Product	Calories	Water	Protein	Fat	Thiamine	Riboflavin
	per 100 g.	percentage.....			mg.	per 100 g
Whale meat						
Lean, edible portion ¹	125	74.0	20.0	4.0	..*	...
Lean, frozen ²	89	78.5	18.8	1.5	0.10	0.08
Lean, salted ³	125	58.9	26.8	1.9	...	...
Ventral groves, muscle portion ³	196	47.0	30.1	8.4	...	...
Ventral meat ³	205	47.2	29.7	9.6	...	...
Unspecified ³	...	71.5—76.5	15.1—18.2	0.7—6.3	...	...
Beef carcass, raw, medium, fat, trimmed to retail ⁴	240	63.0	18.2	18.0	0.08	0.16
Herring, Atlantic, raw ⁴	191	67.2	18.3	12.5	0.02	0.15

Source : ¹Chatfield, 1949 ²Oiso, 1950 ³Bate-Smith and Sharp, 1946 ⁴Watt, 1950

proteins and minerals and a low content of fat in the lean parts of the meat, which are the most acceptable for use as human food.

Concerning recipes and more information on preservation, use and palatability, the reader is referred to the selected bibliography at the end of this article.

Here, let us look into the possibilities of whale meat production by trying to estimate how much whale meat could be produced annually if all edible meat from the total yearly catch of whales were preserved. As the purpose of whaling is not whale meat production, statistics on whale meat production can only be estimated.

The literature presents us with very few estimates. Bate-Smith and Sharp (1946) write, "In the last season before the war it was calculated that the whalemeat caught by twenty British and Norwegian expeditions amounted to over half a million tons," and add that "... allowing for the fact that this meat is boneless, the catch represents an amount of meat equal to more than half the total annual British import of meat." T.H. Barry (1948) feels that this figure is too high and arrives at the following estimate: "About 50 percent of whales is meat... Assuming 20 percent of the meat is fit for human consumption, the annual yield of the Antarctic whaling during the period 1933 to 1939 would be 300,000 tons of meat. In addition, the catch in other parts of the world — mainly the Arctic — might provide a further 50,000 tons." This gives a total estimate of about 360,000 tons as an annual average for the years 1933 to 1939, during which the annual average catch was 43,700 whales of all kinds. From these figures it can be calculated that one whale yielded, on an average, 8,137 kg. edible meat, and that the average weight of a whale is around 81 metric tons.

The two sources quoted above, however, give no details as to how they arrived at their estimates, therefore an attempt will be made here to make a third estimate.

Figures for the whole catch in 1950 which are found in *International Whaling Statistics* (1952)⁵ can be used as an estimate. These figures give the number of whales caught by species. Under the international agreement on limiting the yearly catch in Antarctic

whaling in order to preserve the stock, the number of whales of all species are converted into "blue whale units (BWU), one unit being 1 blue whale, or 2 fin whales, or $2\frac{1}{2}$ humpback whales, or 6 sei whales. These conversion figures have been established on the basis of average oil yields and are connected with the size of the whales. It can be assumed that they are sufficiently correct to express the ratio between meat yield from the various species. As the statistics also mention sperm whales and "others," we will calculate that $2\frac{1}{2}$ of each of these equals 1 BWU. Thus, we have for 1950 :

TABLE 2 — WHALE CATCH CONVERTED INTO BLUE WHALE UNITS

Species	No. of Whales	Blue Whale Units
Blue whales.....	6 313	6 313
Fin whales.....	22 902	11 451
Humpback whales.....	5 063	2 025
Sei whales.....	2 471	412
Sperm whales.....	8 186	3 274
Others	125	50
Total	45 060	23 525

The biggest difficulty in making an estimate is the lack of exact information on the weight of each catch and even on average weights of the various species of whales.

Using the above-mentioned figure, 8,137 kg. edible meat per whale, computed from Barry's figures, the whale meat resources in 1950 should be 363,000 metric tons. However, this figure seems to be too high compared with the figure derived from other sources.

Although Ingram (1948) states that in Norway about 10 tons of edible meat are obtained per whale (mainly fin whales), i.e. about 20 tons per BWU, other authors indicate much lower yields. Van Schaik (1947) considers 5 to 8 tons edible meat per whale, depending on the species, to be more correct. Barry (1948) reports that in the 1947/48 season the U.K. whaler *Balaena* brought home 4,500 tons of edible meat and 170 tons of meat extract from 3,000 whales, i.e. $1\frac{1}{2}$ tons of meat plus 60 kg. of meat extract per whale ; and Pedersen (1949) writes that in the 1948/49 season a Japanese whaling expedition produced 40 tons "other materials" than oil per BWU, which is considered the best result achieved up to that time. However, these figures may indicate the amounts it was commercially feasible to recover rather than the total yields which are technically feasible.

To make our estimate, however, we will use :

- (1) the total catch of whales in BWU (calculated above) ;
- (2) the average weight of 1 BWU (assuming that 1 BWU has about the same weight whether it comes from blue whales, fin whales, or other whales) ;
- (3) the average percentage of the total weight of a whale which constitutes the weight of meat fit for human consumption.

Pedersen (1949), after a rather detailed discussion, finds that the average weight for an Antarctic blue whale can be estimated at 85 to 90 metric tons, for a fin whale at about 50 tons, for the average length 79.5 ft. and 68.5 ft., respectively; the average lengths are statistically well defined. However, the weight variation for whales of the same length, he states, may vary very much, 20 to 30 tons for blue whales, 10 to 15 tons for fin whales.

Barry (1948) gives examples of weighing results of three blue whales and one fin whale, showing that the blue whale carcasses yielded a total of 53.0, 46.3, and 38.0 percent meat. He states that generally whales contain 54 percent meat, and in his calculations uses the figure 50 percent. Barry, furthermore, estimates that 20 percent of the meat is fit for human consumption. Ingram (1948) reports that in Norway whale meat usually is sorted out in 3 grades, giving the following yields:

Whale Meat	Best Steak	Sausage Meat	Fox Meat
..... . Percentage of total meat			
Young whale.....	40	10	50
Carcass in good condition.....	30	20	50
Old whale.....	0 — 10		90—100

Based on the information above we can make a rather conservative estimate, given below, together with a rather optimistic one. In the latter, the weight per BWU has been increased to 95 tons, taking into account Pedersen's information that one fin whale weighs rather more than half the weight of one blue whale, and comparing this with the 1950 catch statistics, which show that about one half of all whales caught were fin whales. In calculating the optimistic estimate, use has also been made of Ingram's information on Norwegian yields, hereby increasing the estimated amount of edible meat per BWU from 10 to 20 percent (including low quality "sausage meat").*

Whale Meat	Conservative	Optimistic
Blue whale units.....	23 623 BWU	23 623 BWU
Weight per BWU.....	85 tons/BWU	95 tons/BWU
Meat per BWU.....	50%	50%
Edible meat per BWU.....	10%	20%
World's resources of edible whalemeat 1950.....	201 000 metric tons	449 000 metric tons
Average	325 000 metric tons	

* After the present article was completed, an interesting article by Ash (1952) appeared. It states that the U. K. Balaena expedition 1951/52 caught a total of 1,292B BWU, and the author calculated the average weight of 1 BWU to be 80 metric tons, containing 42.5% meat on an average (38.8% for blue whales and 45.9% for fin whales). These figures seem to support the conservative estimate above.

According to the U.S. National Research Council (1948) the average daily protein need of for a man is 70 g., of a woman 60 g., of small children somewhat lower, and for older children and pregnant and lactating mothers somewhat more. The average for a population taken as a whole may be estimated at about 60 g. of protein per day per person. Supposing that whale protein would be the only protein available, then these 325,000 tons could provide enough protein for the yearly consumption of a population of about 15 million. If a population were able to provide two-thirds of its protein need from other sources, then these 325,000 tons of whale meat would be sufficient to supplement the diet of a population of about 45 million people by supplying the missing one-third of the protein need for a full year. This is quite an appreciable amount of lean, boneless meat. Assuming that 500 kg. steer give a dressed carcass of about 275 kg. of which about 180 kg. is boneless meat, these 325,000 metric tons of whale meat are equivalent to the yield of boneless meat from 1,800,000 average weight steers (Wilson & Co., 1943).

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RECENT FISHERIES DEVELOPMENTS IN THE MEDITERRANEAN AREA AND IN AFRICA, SOUTH OF THE SAHARA

as reported to FAO by Member Governments for 1950/51

The following extracts are taken from Annual Reports covering the period 1 July 1950 to 30 June 1951 and submitted to FAO by various Member Governments. Extracts from reports from the North American and European regions, and from Asia, the Far East and Oceania were given in *FAO Fisheries Bulletin*, Vol. 5, Nos. 2 and 3-4 respectively.

Mediterranean Area

EGYPT

The total landings of Egyptian fisheries in 1950 were 60,000 metric tons (round fresh weight), a marked increase over the estimated 55,000 metric tons in 1949. This progress was mainly due to two factors: (1) the number of motor boats engaged in trawling operations in Mediterranean ports increased from 160, in 1949, to 239, in 1950, and in the Red Sea (Suez) from 18 to 20; (2) the Sardinella (*S. aurita* and *S. eba*) fishing season (September-December) was exceptionally good and its total yield was estimated at 5,000 metric tons, compared with less than 3,000 tons in the previous year.

Two main targets, designed to increase local fish production about 20 percent, are to be fulfilled within the next three years.

1. *Modernization of Fishing Methods.* The Fisheries Department was encouraging the introduction of up-to-date techniques to replace the primitive methods which were commonly used all along Egyptian shores. This policy had good responses among the fishermen, to the extent that there were, at the time of writing the report, more than 300 motor craft of various sizes, ranging from 45 to 75 ft (14 to 23m.), and from 50 to 200 h.p., distributed among the ports on the Mediterranean and Red Seas. The main fishing methods were trawling, seining and line-fishing: the last is especially encouraged in the Red Sea for fishing on the coral reefs and in the wide areas where trawling is impractical. The number of fishing craft is expected to increase gradually in the years to come.

2. *Fish Culture.* For some years, the Fisheries Department had been raising fresh water fish on a wide scale in artificial ponds near the lakes, to provide the lakes with sufficient fry to increase their productivity. Three fish farms had been established near the lakes of Mariout, Menzalleh and Karoun. The Department of Agriculture intended to increase the number of such fish farms.

ISRAEL

Fisheries in Israel comprise the pond and lake fisheries, mainly carried on by an agricultural settlement near the Lake of Galilee; further it extends to the sea fishery practised both in adjoining and distant waters. Fishing in the Atlantic had only recently started.

It was intended to expand the fisheries as quickly as equipment became available from overseas, which depended largely upon credits obtainable abroad. Since fish played a major part under the government austerity program and was offered instead of meat, markets were assured. In 1951, some two-thirds of the country's requirements were imported.

Although the creation of a fishing fleet is of course a matter of years of development, it was confidently expected that the rate of development could be increased, despite the difficulties encountered in recruiting fishermen to this work and in training young people for it. It was considered, on technical grounds, that expansion of fisheries could be accomplished more easily than the expansion of meat production, and therefore warranted special attention.

Apart from the planned expansion of sea fisheries for which a start had been made, there existed a special interest in directing fish farming, now producing practically only carp, to the production of other varieties of fresh water fish. In this respect, a special study would have to be made in the Far East where pond fish culture had been established on a rather broad basis. Such a study would be facilitated by a scholarship already granted by FAO under the technical assistance scheme. In 1951, fish ponds covered 27,000 dunams (about 2,500 ha.).

A fisheries school with facilities for about 60 students was established by the Ministry of Agriculture in 1950. The full course takes three years.

TURKEY

The sea fisheries resources of Turkey are thought to be very great; in addition, Turkey has many inland waters, rich in fish.

Education and Research. To develop Turkey's fisheries a Hydrobiological Institute was established in 1951 at the University of Istanbul. Three research boats were given to the Institute for the exploration of fishing grounds in the Marmara region and in the Aegean and Mediterranean Seas; another was expected for the Black Sea. A boat was to be given to this Institute for hydrographical research.

Plans were under way to establish a fisheries school for advanced study. This school would also give vocational training in fishing techniques.

Regulations. As the laws regarding fisheries were antiquated and did not meet current needs, a new proposal has been prepared by the Ministry of Commerce and Economy. A new commercial regulation made it possible to import all types of fishing equipment without a licence. Encouragement was given to the export of all

aquatic products including sponges, through new trade agreements and regulations. All fisheries products were exempt from internal taxation and the transport rates were low.

Through the Marshall Plan, 10 cold storage plants were being constructed in different parts of the country. In addition, through indirect aid under the Marshall Plan, eight modern fishing boats and eight trawlers were ordered. U.S. \$200,000 had been committed for fish preservation equipment for private enterprise. Seventy additional refrigerated railway cars of different sizes were purchased from Western Germany and were being put into use.

To make the country's efforts in fisheries more effective and to attract foreign capital, the establishment of a commercial fisheries corporation was being considered. This corporation would be concerned with both production and marketing. There were 20 fishing co-operatives, one association and one organization for fish canning. The government encouraged the establishment of fisheries co-operatives.

Fish consumption propaganda showed positive results, and it was hoped that all means of educating the public would be undertaken.

FAO has been invited to send an expert to Turkey to survey the fisheries situation. Following this, the Turkish Government prepared a request to FAO for technical assistance to include five fisheries experts. An agreement for their work has now been signed and experts are expected to take up their duties in the country shortly.

Africa, South of the Sahara

GAMBIA

Fisheries development forms an integral part of the general policy of raising nutritional standards by increasing local food production and of diversifying the export trade of the individual territories: progress has continued throughout British Colonial Africa. In the Gambia River Creek, fisheries and marine fish trapping are being developed. A subsidiary activity of the demonstration fishing craft mentioned in the 1949 report (see *FAO Fisheries Bulletin*, Vol. 4, No. 3, p. 26) was to survey the resources of the Gambia River and estuary, while a factory ship owned and operated by the Colonial Development Corporation was exploring the fishing possibilities of the coastal area.

SIERRA LEONE

Methods to improve the local fishing industry, including the development of mechanized inshore fishing, were under consideration; an inexpensive and easily constructed fish trap had already given excellent results. The construction of the colony's fisheries station, including a cold storage installation, was almost completed during 1951. The West African Fisheries Research Institute would also be based in Freetown to carry out fundamental research in the four British West African colonies.

NIGERIA

Experiments to test sea fishing gear of various types and to ascertain the optimum depth at which they could be used were carried out with a 45 ft. (13.7 m.) motor fishing boat. Four small powered vessels were acquired to experiment in team fishing ; the boats would be operated by Nigerians under the supervision of a British master fisherman. It was also intended to experiment with the use of a motor vessel as a parent ship to fishing canoes. Demonstrations in improved fishing techniques continued, in particular, the demonstration of a large meshed shark net which proved popular.

Following the appointment in 1949 of a fish farming expert, plans were approved for the establishment of the largest commercial fish farm in Africa at Panyam in the Plateau Province. The farm would cover 202 ha. and it was hoped to produce a ton of fish per acre annually.

Another step in the campaign to supplement the protein deficiency of the local diet was the setting-up of West African Fisheries, a subsidiary of the Colonial Development Corporation, which began deep sea trawling with two 120 ft. (36.6 m.) steam trawlers. This catch was being distributed through cold stores at Lagos and Port Harcourt and sent to inland centers in refrigerated road vehicles.

GOLD COAST

Inshore trawling was proving successful and teams of African instructors were teaching the up-river villagers to fish.

UNION OF SOUTH AFRICA

The companies engaged in ground fish trawling (for the fresh fish markets) operated 44 vessels. The strength of the trawler fleet was not expected to increase very much in the near future, but the total catch would probably advance in relation to an increasing demand in domestic and export markets. There was a continued expansion of the pilchard fishery industry and its fleet strength was also increased. Ten meal and oil factories were operating and some 250,000 metric tons of pilchards were landed in 1951, as compared with some 150,000 metric tons in 1950.

KENYA

A new experimental fish farm on the Tana River was under construction for research work on indigenous fish farming which would include investigations into the most suitable fish for each environment, growth rates, feeding and the possibilities of developing the use of indigenous eels as food. This would be in addition to the research already being done on the Sagana River. A flourishing native fishery was being established on Lake Baringo and the possibilities of other inland waters were being explored.

As regards sea fishing, the two established fishing companies had a good year with improved catches. The main problem was

marketing and distribution, but it was hoped that as the result of steps being taken it would be possible to guarantee the price of fish to the native fishermen, to institute retail up-country establishments and to arrange for fish to be bought at fixed places.

UGANDA

Uganda had fisheries officers to supervise and develop the fisheries of the three main regions, namely, (a) Lakes Edward and George and the minor lakes of southern Uganda, (b) Lake Albert and the Albert Nile, and (c) Lake Kyoga and the waters of eastern Uganda. The Lake Victoria Fisheries Service assumed responsibility for the fisheries of Lake Victoria in January 1951, and much valuable assistance was received from the East African Fisheries Research Organization at Jinja.

In July 1950, six of the largest dams in Acholi were stocked with fish. Experimental boatbuilding continued by the Kempala Technical School but only limited interest was shown by the native fishermen who still preferred their traditional craft.

The Uganda Fish Marketing Corporation made good progress during the year, 2,900 tons of fish having been landed by the end of 1950 on Lake George alone. Arrangements for the internal distribution of fresh fish were unfortunately held up through delay in the arrival of the necessary refrigeration plant.

CENTRAL AFRICAN TERRITORIES OF NORTHERN RHODESIA, NYASALAND AND TANGANYIKA

Fish farming was being further developed in Northern Rhodesia. A joint fisheries research organization was being established by the latter two territories, and in Northern Rhodesia a committee was appointed to make recommendations for the future development of the fisheries, which are an important source of food for the copper mining towns.

BRITISH SOMALILAND AND ZANZIBAR

Particular attention was given to fisheries development in the two territories, both of which are seriously deficient in locally produced food and are in need of export industries. In Zanzibar, a fisheries officer was appointed and a 65 ft. (19.8 m.) vessel was being built. Fish ponds, both marine and fresh water, were started on a fairly large experimental scale, although the latter had not yet been successful owing to the difficulty of excluding predatory fish. The local crawfish industry was investigated and the prospects of developing it for export purposes were considered promising.

There seemed to be no doubt that Somaliland could benefit greatly from the considerable fish and fishing products potentialities of the Gulf of Aden. A fisheries development program was prepared in British Somaliland with the assistance of the Secretary of State's Fisheries Advisor; a powered vessel was bought and a fisheries officer

appointed. Work began in April 1951, and the first results were promising. Local enterprises were encouraged by advice on fishing techniques and marketing. It was hoped that the fishing industry would in time make a useful contribution to the food supply of the Somalis as well as to the export trade which must be developed if the economy of the country is ever to be balanced.

MAURITIUS

Following a fisheries survey, financed by Colonial Development Welfare funds, a private company, the Ocean Trading Company, had been established to exploit the extensive sources of fish revealed. The Company began operations during the year and, although abnormally adverse conditions severely limited the tonnage of fish landed, the findings of the survey were, in general, confirmed.

SOUTHERN RHODESIA

The Fisheries Office embarked on a series of experiments mainly in connection with the optimum size and shape of dams and ponds for commercial fish farming. Experiments were also being conducted in the breeding of hybrid fish.

FISHERIES TECHNOLOGICAL LABORATORY IN THE FAROE ISLANDS¹

A fisheries technological laboratory (Fiskiídnadarstova Føroya) was established in Tórshavn, Faroe Islands, 1 April 1950, to act as a link between the government administration and the fisheries industry. It gives free technological assistance to industrial concerns and is available for consultation for the government fish inspection service and administration. Director of the Laboratory is Karsten Hoydal; a board supervises its activities.

During its first year of operations the laboratory was engaged in drafting regulations for the inspection of salted herring and published a pamphlet on the preparation of salted and spiced herring, etc. It also assisted in working out specifications for the inspection of salted cod. In addition, the Laboratory conducted a training course for the fishery product inspectors and carried out various experiments related to fish preparation.

¹ Fiskiídnadarstova Føroya. Beretning, 1950-51. Tórshavn, Faroe Islands, 13 January 1952.

Conferences and Meetings

Gulf and Caribbean Fisheries Institute

The Fifth Annual Session of the Gulf and Caribbean Fisheries Institute will be held in Miami Beach, Florida, U.S.A. from 17 to 21 November 1952. The program will include sessions on commercial fisheries, consisting of talks from men in the industry, economics, shell fisheries, technology and exploratory fishing, Caribbean fisheries, and a General Session.

International Commission for the North-west Atlantic Fisheries

The Commission met in St. Andrews, New Brunswick, Canada, its temporary headquarters, from 28 June to 9 July 1952, under the chairmanship of A.T.A. Dobson, of the United Kingdom. Attending were commissioners from Canada, Denmark, France, Iceland, Norway, Portugal, Spain, the United Kingdom and the United States, and observers from FAO and the International Council for the Exploration of the Sea (ICES).

Dr. J.L. Kask, Assistant Director of the United States Fish and Wildlife Service was elected Chairman of the Commission for the ensuing year. Dr. Eric Poulsen, of Denmark, was appointed its permanent secretary.

It was announced that Norway had ratified the treaty for the Commission and that formal ratification by Portugal and France was expected in the near future. Countries which have ratified the treaty include Canada, Denmark, Iceland, Norway, Spain, the United Kingdom, and the United States. The permanent site of the Commission's headquarters was discussed but no decision was taken. A committee of commissioners from Iceland, Spain, and the United States will review the matter during the coming year; in the meantime, the temporary headquarters will remain at St. Andrews.

The Commission approved the introduction of a $4\frac{1}{2}$ inch mesh size for the haddock fisheries of Georges Bank, to become effective when ratified by the governments concerned.

Discussions were held between Canadian, Danish, French and Norwegian representatives with respect to the seal fishery. Further discussion will take place at the meeting of the International Council for the Exploration of the Sea in Copenhagen in September, at which time it is likely that some decision will be reached as to whether co-operation in this field can be carried out within the framework of the Commission, by a separate treaty, or by an informal arrangement between the countries concerned.

Scientists will also confer at the ICES meeting to prepare a research program to be carried out in the north-west Atlantic ; this phase of the work will play an important part in the program of the Commission.

Dr. A.W. H. Needler, Director of the Canadian Atlantic Biological Station at St. Andrews, was re-appointed chairman of the Standing Committee on Research and Statistics.

The Commission expressed its appreciation of the assistance given by FAO and ICES.

South Pacific Commission Fisheries Conference

Representatives of Australia, France, the Netherlands, New Zealand, United Kingdom, and the United States, attended a fisheries conference convened by the South Pacific Commission in Noumea, New Caledonia, 14-22 May 1952. Dr. G.L. Kesteven attended as an observer for FAO. The objects of the Conference were to work out a practicable method of bringing together all relevant information available on fisheries in the region : to suggest the best way of investigating quickly the problems of catching, processing, transporting and marketing, and of inducing people to increase the use of local fisheries products ; to make constructive suggestions concerning a statement of the prerequisites for fisheries development in the region to consider and advise on the role of the South Pacific Commission in the development of the fisheries in the region.

The Conference recommended that nutritional studies regarding dietary deficiencies in the region, with special reference to the place of fish in meeting protein deficiencies, be continued ; that territorial fisheries services be established ; that the Commission should disseminate information related to new gear and improved methods of catching fish ; that the various institutions within the region engaged in fisheries and oceanographic research be encouraged to continue this work and to develop the fullest co-ordination of their activities in appropriate cases through the Commission and the Indo-Pacific Fisheries Council ; that the promotion of fishing for consumption or sale be included in programs of community development ; that attention be drawn to the usefulness of training courses being offered by the governments of the Indo-Pacific region with the assistance of FAO and to the possibility of providing a special series of lectures on fisheries administration at the Australian School of Pacific Administration and in other similar institutions, and further that FAO be invited, at the appropriate time, to consider the practicability of assisting the Commission to conduct a special course in fisheries administration for locally recruited officers within the region ; and that the Commission engage a fisheries specialist in order to achieve the objects of the Conference. The Conference recorded its appreciation of the contribution to its deliberations by Dr. Kesteven.

A report has been issued to be considered by the South Pacific Commission at its Tenth Session in October 1952.

XIVth Congress of Marine Fisheries and Industries

The first Congress of Marine Fisheries and Industries to be held since 1937 took place in Boulogne-sur-Mer, France, 19-22 June 1952. The Congress is normally held biennially in different places.

Technical papers were presented and discussed during the meetings of the nine sections, namely, (1) Marine Research, Oceanography and Fisheries; (2) Legislation and Rules, Security at Sea; (3) Ship Management; (4) Marketing and Transportation; (5) By-products Industry; (6) Processing of Fishery Products: (a) canned, preserved, salted, dried and smoked fish; (b) chilling and freezing; (7) Oyster and Marine Culture; (8) Publicity; (9) Overseas Fishing, Scientific Studies, Marine Industries. The papers will be published in the proceedings of the Congress.

The Congress was held during the International Exhibition of Fisheries and Related Industries. Among the fishing gear and equipment shown at the Exhibition were machines for heading, cleaning, de-boning, filleting and peeling fish and shellfish; echo sounders, equipment for the electric attraction of fish; marine engines; freezing machines, insulation and refrigerators for commercial purposes; modern retail fish shops; and nylon twine for making fish nets. Demonstrations of different ways of cooking fish were given daily. Fisheries films were also shown.

FAO was represented by Jacques Chaux.

International Seaweed Symposium

An International Seaweed Symposium was held in Edinburgh, Scotland, from 14 to 17 July 1952, attended by some 200 scientists, industrialists and others interested in seaweed research and utilization from Algeria, Australia, Canada, Ceylon, Chile, Denmark, Faroe Islands, France, Germany (Federal Republic), Gold Coast, Holland, Ireland, Mexico, Norway, Portugal, South Africa, Spain, Sweden, U.K., U.S.A., and Zanzibar. In addition there were written contributions from a further 9 countries, namely, Argentina, Iceland, India, Indonesia, Jamaica, Japan, New Zealand, Philippines and Yugoslavia.

The first three sessions were concerned with various aspects of the algal populations of Norway, South Africa, Southern Australia, Sweden, the Cotenin coast of France and the Malagan coast of Spain. Results obtained in Norway and Canada from the use of the surveying techniques and equipment developed in Scotland in 1946 were described. Similar types of seaweed were found growing underwater in each of the three countries. From the results obtained already, it would appear that the heavy growth of seaweed in Scottish waters is exceeded in both Nova Scotia and Norway, the former supporting an algal crop capable of yielding up to 120 tons per acre, and the latter averaging about 45 tons per acre, compared with the Scottish 20 to 30 tons per acre.

The fourth and fifth sessions were devoted to chemical problems. Thirteen papers from Canada, Ireland, Norway, South Africa, Sweden and the United Kingdom covered a wide range of topics, including the chemical constitution of certain algal carbohydrates, and recent novel physico-chemical Canadian studies on a number of seaweed chemicals.

An important Swedish paper indicates with some certainty that vitamin B₁₂ occurs in a number of common red and brown seaweeds. As hitherto no plant source of this vitamin was known, this work opens up a completely new field of interest to animal nutritionists and the animal foodstuff industry.

A session devoted to the utilization of seaweed in the chemical, medical and foodstuff fields proved to be very provocative. Papers dealt with the uses of alginates which reflected the enormous expansion of the British alginate industry in the postwar years; with an extensive market survey recently carried out in the United States to discover new uses for seaweed extractives and with the feeding of seaweed meal to laying hens, etc.

For the first time an attempt was made to assess the total seaweed resources of the world. Contributions were made by experts from 17 countries, who drew up a map on which the known seaweed beds of potential or actual economic value were recorded. No complete assessment is yet possible since detailed surveys have been carried out only in Canada (British Columbia and Nova Scotia), New Zealand, Norway, Scotland, and along the Pacific west coast of the United States. These seaweed bearing areas are known to support a growth in excess of 100 million tons.

Abstracts of all papers presented, together with a resumé of the discussions and of the world seaweed resources, will be published shortly by the Institute of Seaweed Research, Inveresk, Midlothian, Scotland. A second conference is planned in Norway in 1955.

Fisheries Division Activities

General Fisheries Council for the Mediterranean

The first meeting of the General Fisheries Council for the Mediterranean was held in Rhodes, Greece, 21-24 July 1952, and was attended by delegates from France, Greece, Israel, Italy, the United Kingdom, and observers from Monaco, the United Nations, the International Council for the Exploration of the Sea, and the International Commission for the Scientific Exploration of the Mediterranean Sea. Egypt is also a member of the Council, but was not represented at the meeting.

The opening session was addressed by Jean Zighdis, the Minister of Industry of Greece, and Dr. D.B. Finn, the Director of FAO Fisheries Division, on behalf of Norris E. Dodd, Director-General of FAO. The meeting was chaired by Mr. Zighdis, with Jean le Gall, (France), as vice-chairman.

The following Council officers were elected: chairman, Jean le Gall, first vice-chairman, C. Serbetis (Greece); second vice-chairman, T. Soljan (Yugoslavia).

An Executive Committee, composed of the chairman and the two vice-chairmen, was appointed. The Executive Committee will also act as an editing committee. Technical committees on exploration, production and utilization of Mediterranean fisheries were established, and the Chairman and two Vice-Chairmen of the Council were named chairmen of the three respective committees. Members of the committees are to be appointed by interested countries.

Working groups on specific questions are to be established in each country.

It was decided that the program of work of the Council should include:

- (1) exploration of new fishing grounds;
- (2) research on tuna and sardines (net gear and methods);
- (3) factors hampering the fisheries (problem of maintenance of boats and gear, pollution of waters, etc.);
- (4) biology problems related to different gears and fishing methods, overfishing and natural restocking;
- (5) professional diseases and hygiene of fishermen;
- (6) establishment of statistics and collection of information usable for biologists and technicians, standardization of terms;
- (7) vocational training along the lines of the Latin American Fisheries Training Center, the Indo-Pacific Fisheries Statistics Training Center, and the Indonesian Fish Culture Seminar.

Monaco has applied for membership in the Council.

The first meeting of the Executive Committee was held on 25 July 1952, to prepare the agenda for the next meeting to be held in Paris on 1 September 1952.

Fish Culture Seminar

FAO, in co-operation with the Government of Indonesia, conducted a Fish Culture Seminar in Bogor and Djakarta, Indonesia, from 1 May to 15 June 1952. The purpose of the course was to give fisheries workers in the Indo-Pacific region an opportunity for training in research, development and extension activities as required in the culture of fish in ponds and rice fields.

Inland waters — fresh and estuarine — are a source of considerable importance for the production of animal food for many countries in the Indo-Pacific region. Some countries in the region already possess an extensive pond industry, while others intend to increase fish production by the introduction of modern fish culture methods. Since this development is often hampered by lack of experienced personnel, the Indo-Pacific Fisheries Council recommended at its meeting in Cronulla in 1950 that courses should be organized for the training of fish culturists. In accordance with this recommendation the Government of Indonesia sponsored a seminar on brackish-water fish culture in 1951; this was held in Djakarta and was open only to a limited number of students. After the successful conclusion of this course it appeared desirable to repeat the training on a larger scale, including fresh water work and inviting participation from all countries of the region, and the Government of Indonesia offered to sponsor a second seminar in co-operation with FAO. Indonesia is an ideal site for such a seminar since it is the only country in the region where all facilities for giving training in fresh and brackish-water fish culture are available. Member Governments of the Indo-Pacific Fisheries Council were invited to nominate candidates for attendance; and from these, 21 students from eight countries were selected.

The following 18 students attended the seminar: Chun-foo Hsu and Han Kao (China); Peter Devasigamani Diviavasagam Devadas, Vadassery Thomas George, Thirumoolanathan Muthuvelayudham Pillai, and Ajit Kumar Roy Chowdhury (India); R. Isnandi Isnandar, R. Rustami-Djajadiredja, R.M. Samirum Wirjodinolo, M. Sukandi, and R. Sumarto (Indonesia); Subodh Kumar Chakraborti, and M. Abdus Sattar (Pakistan); Pedro A. Acosta (Philippine Islands); Mek Boonbrahm, Umpol Pongsuwana, and Ariya (Aree) Sidthimunka (Thailand); and Thien-Buu Cao (Viet-Nam). It was regretted that the three students nominated from Japan were unable to attend.

The trainees were a fairly uniform group of workers, who hold responsible and permanent positions on the staffs of the fisheries departments in their home countries. Three were senior officers with experience in research and administrative work; the others were

young officers with little practice in extension work and no training in fish culture.

The following staff of instructors and demonstrators was provided by the Indonesian Government :

<i>Instructors</i>	<i>Subject</i>
R.O. Ardiwinata and A. Jansen, Laboratory Inland Fisheries, Djakarta	Fresh water fish culture
G.A.W. van der Goor, Institute for Agricultural Research, Bogor	Rice culture
Dr. J.D.F. Hardenberg, Laboratory Investigation of the Sea, Djakarta	Anatomy of pond fishes
Dr. K.F. Vaas and M. Sachlan, Laboratory Inland Fisheries, Bogor	Chemical analysis of pond water ; plankton of fauna in fish ponds
M. van der Voort, Institute for Soil Research, Bogor	Soils of fish ponds
<i>Demonstrators</i>	
R.O. Ardiwinata, { A. Jansen }	Fresh water fish culture
R.S. Atmohardjono	Brackish water fish culture
Dr. K.F. Vaas, M. Sachlan	Research methods in lake fisheries

FAO put the services of W.H. Schuster, its chief fish culturist, at the disposal of the Government for the duration of the seminar. Mr. Schuster took charge of the lessons and demonstrations on brackish-water fish culture and acted as general advisor.

In preparing the curriculum of the seminar, it was decided that the Indonesian methods of fish culture should be used as a means of illustrating the principles in which the culture of fish in enclosed waters is based. Accordingly, only a few lessons were devoted to basic research. Ample time was given to field demonstrations of cultural methods, including investigation and discussion of the factors in control of production.

The curriculum of the seminar comprised :

(1) *Lessons on the chemical and physical factors controlling fish production in ponds, rice fields and lakes.* These included limnological investigation of tropical inland waters ; hydro-chemistry, planktology, ecology of fresh and brackish water fishes, anatomy of pond fishes

practical exercises in the common methods of limnological investigation ; fry transport in oxygen cans, weed eradication with substances containing 2,4-D ; soil investigation.

(2) *Field demonstration of the culture of fresh water fish.* This included spawning and hatching of *Cyprinus*, *Puntius*, *Osteochilus*, *Osphronemus*, *Holosoma*, *Trichogaster* and *Tilapia* in various types of ponds ; rearing of *Cyprinus*, *Puntius* and *Tilapia* in rice fields ; paddy with fish, fish as second crop and fish as interim crop between rice ; construction and maintenance of ponds and hatcheries ; fry trade and fry transportation ; pond fertilization ; use of sewage water for piscicultural purposes ; rearing of fish in floating cages.

(3) *Field demonstration of the culture of brackish water fish.* Included were capture, selection, storage and transport of milkfish fry ; preparation of fry ponds and the stocking of milkfish in fresh and brackish water ponds ; rearing of milkfish according to various systems ; maintenance and fertilization of brackish water ponds, capture of milkfish and prawns ; rearing of *Tilapia* in pure stock and in association with milkfish ; fertilization of ponds with green manure ; plantation of mangroves ; control of mosquito larvae.

(4) *Exploitation of inland waters.* This covered stocking, culture and capture of *Cyprinus*, *Puntius*, *Osteochilus*, *Osphronemus*, *Trichogaster* and *Tilapia* in small lakes and irrigation reservoirs ; control of water hyacinth in open waters.

(5) *Fisheries extension.* The work included organization of extension services ; training of officers and village workers ; construction of pilot ponds and hatcheries ; operation of demonstration farms.

The theoretical lessons were given in the laboratory of the Inland Fisheries Service in Bogor, where an ample lecture room, extensive laboratory space and adequate equipment for microscopic and chemical work was at the disposal of the students. The full text of all lectures was printed or mimeographed. The lessons were followed by practical exercises and demonstrations in the laboratory and the experimental ponds belonging to the Institute for Agricultural Research.

The most important part of the training consisted of a series of field demonstrations showing all steps in breeding and rearing Indonesian pond fishes. At the hatcheries, pond farms, and rice fields visited, the students saw all important operations actually carried out. For the greater part, the demonstrations were held at private pond farms and rice fields. Co-operation was obtained from the local administration officers, who succeeded in making all important pond areas accessible to the Seminar. The officers of the Inland Fisheries Extension Service arranged the excursions.

The students were given the opportunity of visiting a number of scientific institutions including the Central Agricultural Research Station, the Institute for Plant Diseases, the Institute for Plant Breeding, the Rubber Research Station, the Zoological Museum and the Institute for Soil Science. The Sea Fisheries Service organized an excursion

on board one of their vessels during which fisheries in coastal waters were demonstrated.

At the end of the seminar students were requested to produce a paper comparing the methods applied in Indonesia with those in their home countries. It appeared from these papers that the students had made themselves sufficiently familiar with the Indonesian methods of fish culture and had achieved a reasonable understanding of the principles involved. A diploma certifying successful participation in the school was given to all students.

Regional Fisheries Office for Latin America

H. Rosa, Jr., fisheries biologist on the Headquarters' staff, has been appointed FAO Assistant Regional Fisheries Officer for Latin America. Mr. Rosa takes up his new duties at the end of September and will be located at the FAO Sub-Regional Office in Santiago, Chile. Mr. Rosa, who comes from São Paulo, Brazil, joined the Organization in 1949. Prior to this he was fisheries biologist in the State of São Paulo's Department of Agriculture. He received his Bachelor and Master of Arts degrees in Biological Sciences from Stanford University, Stanford, California, U.S.A.

The appointment of an Assistant Regional Fisheries Officer for Latin America stems from the expansion of FAO's activities in the region, particularly in direct technical assistance and in the work of the Latin America Fisheries Council. Dr. B.F. Osorio-Tafall is the FAO Regional Fisheries Officer for Latin America as well as the representative of the Director-General for western South America.

Dr. Osorio-Tafall recently completed a tour of Ecuador, Peru, Paraguay and Bolivia. He consulted with fisheries officers of these countries on the provision of technical assistance and the work of the Latin American Fisheries Council. While in Lima, he represented the Organization at a meeting of the UNESCO chiefs of technical assistance missions. In early October, Dr. Osorio will spend two weeks at Headquarters in Rome for consultations.

Expanded Technical Assistance Program

A suggested program for technical assistance in fisheries development, stemming from the reconnaissance survey carried out by Dr. Bottemanne, has been forwarded to the Government of Brazil for consideration. The program includes assistance in fishing explorations and methods; fish handling processing and marketing; fisheries education; and fisheries statistical procedure. Meanwhile, at the request of Brazil, an agreement is being prepared for a fisheries biologist and a fish culturist to conduct surveys in their respective fields.

Alan Glanville has submitted a report on his year's work on the boat and gear mechanization project in Ceylon. The Government of

Ceylon has requested that this project be taken up again in January 1953 and continued for another year. A marine engineer superintendent will be assigned to Ceylon as soon as he can be granted leave by his employers. Recruitment is in progress to find two fish harbor specialists as well as one biologist and one economist; it has been found that assistance in the field of algology is not needed.

J. Fridthjof will return shortly to Headquarters to prepare a report on his activities aimed at increasing the consumption of hake in *Chile*; a newly formed committee of various government agencies will carry forward his project. An agreement is under consideration for the continuation of this as well as the biological project begun by Dr. E. M. Poulsen.

S. Y. Lin continues his fish culture work in *Haiti*; he will soon be joined by Shimon Tal, of Israel, who will assist in extension work in pond fish culture.

A. van den Eelaart, of the Netherlands, and Galliano Amodeo, of Italy, have reported to *Iraq* to begin work concerning the development of inland and sea fisheries respectively.

A.E. Hofstede, of the Netherlands, has been selected as the biologist to assist in improving fish culture practices and in the development of a management program for fisheries in several lakes of *Israel*; he is expected to report to Headquarters for briefing during August. A second fisheries biologist is still being recruited.

P.E. Paulsen, of Canada, has accepted an appointment in *Korea* to assist in preparing an over-all five year program for the rehabilitation and development of fisheries there. He will serve as a member of an FAO Agriculture, Fisheries and Forestry Mission, requested by the United Nations' Korean Reconstruction Agency (UNKRA).

An agreement is being drafted to provide a fish culturist for *Mexico*.

Harald Fibiger, of Denmark, has been selected as the fish harbor specialist to work in *East Pakistan* with Nils Jangaard, commercial fisheries consultant; both will report to Rome in September for briefing.

Two fisheries biologists are being recruited to work on the tuna-bait and shrimp fisheries in *Panama*.

Dr. el Saby, of Egypt, and Luigi Farina, of Italy, will be reporting to Rome in August for briefing prior to reporting to *Saudi Arabia* to undertake a fisheries exploratory survey in the Red Sea. The Egyptian vessel to be chartered for use in this survey is being overhauled in Italy.

A. Fraser-Brunner has returned to Rome after completing his reconnaissance survey of the fisheries of *Italian Somaliland*; both he and H. Ogilvie are preparing their reports and assisting in planning the fisheries exploratory survey to be conducted during the next fishing season.

With the concurrence of the Government of *Syria*, it is planned to begin a fisheries exploratory survey off the coast of this country in January 1953, and to begin fish culture and fisheries administration projects at a later date. Recruitment is in progress to locate three experts for these projects.

An agreement is being drafted to provide five fisheries experts for

Uruguay in the fields of production, research, distribution and administration.

H. Kristjonsson, FAO technologist, will survey the fisheries of *Yemen* to determine the type of technical assistance needed to increase the fish production of the country. He will begin this assignment late in September.

R. Vesterhus will report to Rome late in August for briefing prior to taking up duty in *Yugoslavia* for work on improving standards of fish preservation. An agreement is being drafted to provide six more experts in various fisheries fields.

Notes on Films

THE STORY OF HALIBUT OIL. Producer and distributor: Crookes Laboratories Limited, Export Dept., 104/112 Marylebone Lane, London W. 1. Technical data: 16 and 35 mm., black and white, sound, 30 minutes running time; 35 mm., approximately 2,700 feet; commentary and titles in English. Produced in 1949. Price: 16 mm. £12, approximately; 35 mm. £34, approximately. Rental free.

Shows fishing for cod and halibut by long-lining from steam vessels in the United Kingdom, including the work on deck, baiting of hooks, and the setting of lines, floats and buoys in smooth as well as rough water. The hauling of the line by means of power gurdies, and the gaffing of the fish and the cutting out of the halibut livers, which are collected in special barrels, are shown. The extraction and processing of the liver oil is illustrated with laboratory equipment and views of commercial plants are added, including the refining of the oils for medicinal purposes and the standardization, followed by the bottling and manufacture of capsules. The principle of vitamin A assays through spectrographic methods is demonstrated and explained by drawings; the preparation of samples for the determination is shown. The biological vitamin D assays by means of rats is described and demonstrated in detail, including X-rays of rat skeletons showing effects of various degrees of deficiency in vitamin D.

E.H.

HOW CONWAY MUSSLES ARE FISHED AND PURIFIED. Producer and distributor: Ministry of Agriculture and Fisheries, Fisheries Experiment Station, Castle Bank, Conway, Caernarvonshire, Wales. Technical data: 16 mm., black and white, silent, 700 feet, 30 minutes running time, titles in English. Price: arrangements can be made, on application to the Ministry, for Kodak Ltd. to produce a copy from the original at the usual rate for copying reversal film. Produced in 1939; to be remade shortly.

Shows mussel beds at low tide and the digging of mussels by hand with rakes and their transport to the purification plant at Conway. The cleaning and preparation of the purification tanks is shown, and also the methods of spreading out and spraying the mussels on racks, filling the tanks with sterilized water, sterilization of the empty bags and the boots of the workers and the collection and packing of the purified mussels. The sealing of each bag with a red inspection seal and the transportation and shipping of bags to the markets follow.

The principles of purification are illustrated with mussels being held in glass beakers, showing the turbid water becoming clear and the extrusion of pseudo-faeces. The bacteria contents of raw and purified samples are contrasted by means of bacterial plates.

E.H.

HERRINGS FOR SALE. Producer: Editorial Film Productions, Ltd. Distributor: Information Division, Unilever Ltd., Unilever House, Blackfriars, London, E.C.4. Technical data: 16 mm., black and white, sound, 793 feet; 35 mm., black and white, sound, 1,982 feet; about 20 minutes running time, commentary and titles in English. Produced in March 1951. Price: 16 mm. print £7.0.0d; 35 mm. print £14.12.0d., obtainable from Unilever House and the following film libraries: GB Equipments Ltd., Sound Services Ltd., Education Foundation for Visual Aids. Rental: free of charge from distributor.

A chapter from the *Unilever Magazine* serial of documentary films showing the unloading of herring boats and the auctioning and inspection of the herrings. Scottish girls preparing the herring for kippering, the smoking itself, the shipping of fresh herring in ice, klondyking, and the block-freezing of herring are included. A flashback shows the fishing for herring by drifter trawlers, the ways of setting out the nets, drifting and hauling, and the making and mending of nets.

E.H.

THE SILVER HAUL. Producer: Editorial Film Productions Ltd. Distributor: Great Britain: theatrical distribution through Warner Bros.; U.S.A.: theatrical and non-theatrical distribution through the United Kingdom Foreign Office; Australia, New Zealand, Canada, India, Pakistan and Ceylon: non-theatrical distribution through Commonwealth Relationship Office. Technical data: 35 mm., black and white, sound, 2,208 feet; 16 mm., black and white, sound, 885 feet; 24 minutes running time, commentary and titles in English. Price: 35 mm. print, £18.13.0d.; 16 mm. print, £8.0.0d., obtainable (for distribution abroad only) from Information Division, Unilever Ltd., Unilever House, Blackfriars, London, E.C.4. Rental: free of charge from Information Division, Unilever Ltd., Unilever House, Blackfriars, London, E.C.4.

A longer edition prepared for theatrical distribution of "Herrings for Sale" mentioned above.

E.H.

Notes on Publications

FWS 9.2 FISHERIES STATISTICS — CANADA UDC 31:639.2(71)

Fisheries Research Board of Canada, Atlantic Biological Station. *Circular* 1952 *Statistical Series, No. 1*. St. Andrews, New Brunswick, Canada, May, 1952. 12 pp., illus., tables. In English.

This first statistical circular — "Landings of Fresh Groundfish by Offshore Vessels at Nova Scotia Ports," by W.R. Martin and F.D. McCracken — presents a part of the data collected by the Fisheries Research Board of Canada for the Canadian Atlantic groundfish fishery for the year 1947. Presents and comments on four statistical tables showing monthly landings of fresh groundfish at Nova Scotia ports by type of craft used, the catch per unit of effort for cod and haddock, and total catch by type of craft and areas adopted by the North American Council on Fishery Investigation. When brought up to date, the series will be published annually.

FWS 9.2 FISHERIES STATISTICS — U.S.A. UDC 31:639.2(73)

Peterson, C.E. FISHERY STATISTICS. *Fishery Leaflet 197*. United States 1952 Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. Revised February 1952. 12 pp. In English.

Reviews the statistical and market news publications released by the U.S. Fish and Wildlife Service, with a short account of the information contained in each publication, the frequency with which it is released, and information on how to obtain it.

FWS 9.2 FISHERIES STATISTICS — U.S.A. UDC 31:639.2(73)

United States Department of the Interior, Fish and Wildlife Service. 1952 FROZEN FISH - 1951. *C.F.S. No. 721* (Annual Summary). Washington 25, D.C., U.S.A. 13 pp., illus., tables. In English Free.

After a very brief introductory note, the report summarizes the 1951 data on the monthly production of frozen fisheries products in the U.S.A. and Alaska by species. Statistical data are provided on the holdings of fisheries products by species and months, together with a list of cold storage warehouses, freezing, and storing fisheries products in 1951. The last table provides details of the annual imports of certain fisheries products 1946-50.

FWS 9.11 OCEAN — ADRIATIC SEA UDC 551.46(262)

Buljan, Miljenko and Marinkovic, Marija. RESULTS OF INVESTIGATIONS 1952 INTO CYCLIC SALTS ON THE EAST COAST OF THE ADRIATIC (SPLIT). *Acta Adriatica* (Institute of Oceanography and Fisheries, Split, Yugoslavia), Vol. 4, No. 9. 33 pp., 9 fig., appendix, bibl. In English, with English and Yugoslavian summaries.

Explains the spreading into the atmosphere of salt from the sea water due to the influence of the wind, and its eventual transport to the land in regions of the east coast of the Adriatic Sea.

Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven
1952 [PUBLICATIONS OF THE OCEANOGRAPHIC INSTITUTE IN BREMERHAVEN], (Kommissionsverlag Franz Leuwer, Bremen, Germany), Vol. 1, No. 1. 128 pp., charts, tables. In German.

First of a series of publications on work carried on in the Oceanographic Institute, in Bremerhaven. Contains seven papers on marine biology and hydrography including: "Remarks on the Synecology of the Pelagic Zone," "On the Occurrence of the Bream *Brama rayi* in North European Waters," "Studies on Brackish and Sea Water Mycology," "Contributions to the Hydrography of the Estuary of the Weser."

Ruttner, Franz. Grundriss der Limnologie (Hydrobiologie des Süßwassers) [OUTLINES OF LIMNOLOGY (FRESH WATER BIOLOGY)]. 2nd ed. 1952 Walter de Gruyter & Co., Berlin. 232 pp., 51 illus., bibl. In German. Price DM. 16.80.

A revised edition of Ruttner's well-known textbook on limnology first published in 1940. The marked progress in fresh water biology during recent years made it desirable to rewrite some chapters to give full credit to recent investigation. The first section given a description of the physical and chemical factors operative in natural bodies of waters; the second describes the fresh water biota. Gives technical terms in a separate glossary and recent literature in a comprehensive bibliography.

Braarud, Trygve and Hope, Brigit. THE ANNUAL PHYTOPLANKTON CYCLE OF A LANDLOCKED FJORD NEAR BERGEN (Nordaasvatn). *Reports on Norwegian Fishery and Marine Investigations* (Director of Fisheries, Bergen, Norway), Vol. 9, No. 16. A.s. John Griegs Boktrykkeri, Bergen, Norway. 26 pp., tables. In English.

The annual phytoplankton cycle of a landlocked fjord is discussed on the basis of quantitative records for 1941-42. The main factors influencing phytoplankton abundance are enumerated, including local factors such as pollution by sewage, ice cover and currents.

Schuster, W. H. and Djajadiredja, R. LOCAL COMMON NAMES OF INDONESIAN FISHES. Published for the Ministry of Agriculture of Indonesia, Laboratory for Inland Fisheries, by N. V. Penerbit W. Van Hoeve - Bandung, Indonesia, and 's-Gravenhage, Netherlands. 276 pp. In English.

Contains all the local names of fishes found in Indonesia, together with their scientific equivalents. The first part of the book gives the local names in alphabetical order followed by the area of their usage, their scientific names and the family and order to which they belong. In the second part the scientific names are arranged in alphabetical order followed by their equivalent family and order and the areas of distribution of the species with the different local names used. This arrangement makes it possible to determine the different species for which the same common name is applied or the different common names used for the same species in different localities.

International Pacific Salmon Fisheries Commission. ANNUAL REPORT, 1952-1951. New Westminster, Canada. 35 pp., 4 fig. In English.

Discusses the 1951 salmon runs in the rivers managed by the Commission; gives information on the meetings held during the year, recommendations made, catch statistics of sockeye salmon for the United States and Canada, and other information on the work of the Commission.

FWS 1.3 SALMONS, ETC. — CANADA

UDC 597.5(71)

Haig-Brown, Roderick L. CANADA'S PACIFIC SALMON. Department of 1952 Fisheries of Canada, Ottawa, Canada. 23 pp., illus. In English.

A popular description of the habits, fishing methods, processing, commercial value and conservation, including its international aspects, of the five species of Canadian Pacific Salmon.

FWS 1.95 WHALES, DOLPHINS AND PORPOISES UDC 599.51
— JAPAN

Omura, Hideo; Nashimoto, Setsuo; and Fujino, Kazuo. SEI WHALES 1952 (*Balaenoptera borealis*) IN THE ADJACENT WATERS OF JAPAN. Fisheries Agency of Japanese Government, issued by the Japan Whaling Association, Tokyo, Japan, May 1952. 80 pp., 5 pl., 21 fig., 2 appendices. In English.

A study conducted to verify the possible existence of two races of sei whales in the adjacent waters of Japan. Body proportions were taken and the number of ventral grooves and baleen plates were counted in a number of specimens together with analysis of stomach content. The existence of two races of sei whales, the northern and southern types, is accepted by the authors until further investigations are made.

FWS 0.8

WATER PURIFICATION

UDC 628

Vom Wasser - Ein Jahrbuch für Wasserchemie und Wasserreinigungstechnik 1951 [WATER - A YEARBOOK OF WATER CHEMISTRY AND PURIFICATION] (Verlag Chemie, GmbH., Bergstrasse, Weinheim, Germany), Vol. 18, 1950/51. 430 + 36 pp., 163 illus., 81 tables. In German. Price DM. 29.80.

No. 18 in the series of yearbooks for water chemistry and water purification edited by the Committee on Water Chemistry of the Union of German Chemists. Contains 27 articles on subjects as varied as hydrobiology and bacteriology of river and lake water, filtering of drinking water, sewage water utilization, effect of various chemicals on aquatic organisms, water analyses and purification of water for industrial use. A handbook for those interested in the chemical, physico-chemical and bio-chemical problems of water use.

FWS 1 FISHERIES — UNITED KINGDOM

UDC 639.2 (410)

A REVIEW OF THE BRITISH FISHING INDUSTRY. *Continental Daily Mail*, 1952 April 1952. 8 pp., illus. In English.

This annual review of the British fishing industry contains an article on the importance of fisheries by Commander A.C. Hardy, a message from Dr. D.B. Finn, Director of FAO Fisheries Division, and various articles on newly built British fishing vessels, including the new factory ship *Fairfree II*.

FWS 1 FISHERIES — HONG KONG UDC 639.2(512.317)

Hong Kong. Department of Agriculture, Fisheries and Forestry.
1952 ANNUAL REPORT, 1950/51. Part III, Fisheries; Part VI, Revenue and Expenditure. Director of Agriculture, Fisheries and Forestry, Hong Kong. 24 pp., tables. In English.

The first report of the newly formed Department of Agriculture, Fisheries and Forestry covers the 12 months ending 31 March 1951. Reviews marine fisheries, including marketing and fishing conditions, the mechanization of fishing craft, fishing population, etc; and fresh water fisheries including the export of fish fry by area and fish ponds; and oyster farming. Gives revenue and expenditure of the Department with regard to fisheries and statistical tables of the main types of fish sold through the fish marketing organizations, the number of junks, and fishermen based at Hong Kong, fish ponds and their production, and the stocking of fish farms.

FWS 1 FISHERIES — JAPAN UDC 639.2(52)

Japan, Fisheries Agency. FISHERIES OF JAPAN, 1952. Tokyo, Japan
1952 122 pp., illus. In English.

Reviews the prewar and postwar situation of Japanese marine and inland fisheries industries. After a general introduction on Japan, its peoples, and the fishing industry, the historical development of fisheries industry, the historical development of fisheries administrative organizations is discussed with reference to important current fisheries policies such as fisheries reform, improvement of fisheries facilities and the conservation of resources. The fishing fleet, marine fisheries operations, coastal fisheries, the fish culture industry in fresh waters and shallow seas, and the pearl culture industry are analysed, and statistical tables given. The final section discusses the distribution and consumption of marine products in Japan, a review of the processing of marine products, and an analysis of the prewar and postwar export trade in marine products. A list of fisheries organizations and companies is appended.

FWS 1.015 FISHERIES — CEYLON UDC 639.2(548.7).

Do Zylva, E.R.A. ADMINISTRATION REPORT OF THE ACTING DIRECTOR
1952 OF FISHERIES FOR THE YEARS 1940 TO 1950. Part II, 1948 to 1950. Government Publications Bureau, Colombo, Ceylon.
62 pp., tables. In English. Price Rs. 1.25; postage 25 Ceylon cents.

Contains information on the activities of the Fisheries Department including international collaboration, statistics on imports and exports since 1940, reorganization of the Department, production, equipment and personnel for 1950, and detailed information on the work of the three technical divisions, administration, development, and research.

FWS 1 FISHERIES — NORTHERN RHODESIA UDC 639.2(689)

Northern Rhodesia, Game and Tsetse Control Department. ANNUAL
1952 REPORT FOR THE YEAR 1951. Government Printer, Lusaka,
Northern Rhodesia. 18 pp., 5 appendices. In English. Price ls.

Reviews the activities of the Department in game conservation, tsetse control, fisheries, fish farming and of the newly formed Northern Rhodesia and Nyasaland Joint Fisheries Research Organization.

Finley, Bob. THE RELATIVE PRODUCTIVITY AND VALUE OF THE FISHERIES OF THE UNITED STATES AND ALASKA. *Fishery Leaflet 108*. 1952. United States Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. Revised April, 1952. 10 pp., illus., tables. In English. Free.

A revision of the paper by A.M. Sandberg, published in February 1945. In the light of statistical tables, it discusses briefly the relative importance of the fisheries of the United States with those of other countries, the order of importance by volume and value of the various species caught in the United States and Alaska, and the contribution of each of the states to the total production. Most of the statistical tables refer to the year 1949.

Keefe, Ruth V. SOURCES OF INFORMATION CONCERNING THE COMMERCIAL FISHERIES. *Fishery Leaflet 362*. 1952. United States Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. Revised January 1952. 23 pp. In English. Free.

A revision of the list originally compiled by R. Paul Elliott in 1950. Gives references, mainly U.S., to sources of basic information on commercial fisheries including meal and oil and other by-products; canning; fish consumption; cookery; directories; employment; fishes; whale oil; shellfish; freezing; gear; marketing; salting; sanitation; smoking; spoilage; statistics. Also gives technical and trade journals, films and micro-film sources. Lists some international and Canadian references.

PACIFIC FISHERMAN - 1952 YEARBOOK NUMBER. *Pacific Fisherman* 1952 (Miller Freeman Publications Inc., 71 Columbia St., Seattle 4, Washington, U.S.A.), Vol. 50, No. 2. 300 pp., illus. In English.

This Yearbook provides a directory of fisheries of the Pacific coast of the United States, together with tables on catch and processing of salmon and tuna and their markets. Special features discuss freezer ships, imports, packs and products, Mexico's Pacific fisheries, etc. The production and processing of Pacific sardines, mackerel, crustaceans and mollusks, etc. and frozen fish, oils and meals, etc., are reviewed. Extensive tables support the text throughout.

International Labour Office. CONDITIONS OF WORK IN THE FISHING INDUSTRY. *Studies and Reports*. New Series, No. 30. Geneva, Switzerland. 215 pp. In English, French and Spanish. Price U.S.\$1.25 or 7s.6d.

Contains information obtained on detailed questionnaires sent to 44 State Members in 1947 concerning the organization of the fishing industry and the conditions of work of fishermen. Has chapters on the general survey of the fishing industry; wages, hours and manning; general conditions of employment and welfare; and social security.

FWS 1.1 FISHERIES INDUSTRIES — TUNAS, UDC 639.227 (85)
MACKERELS, ETC. — PERU

Jarvis, N.D. FISHERIES DEVELOPMENT IN PERU. National Canners Association, 1133 20th St., N.W., Washington 6, D.C., U.S.A., Jan. 20, 1952. 10 pp. In English.

Address at the Fishery Products Conference of the National Canners Association on the Peruvian fisheries industry during the last 12 years. Deals mainly with the technical assistance given by the U. S. Government towards the development of the tuna and bonito canning industry and the quality control of the products. The canning operations are described. Reviews the production of salted, smoked and canned fisheries products as well as the technical and economic position of the canning industry and its possibilities.

FWS 2.14 WHALING UDC 639.245.1

International Whaling Commission. INTERNATIONAL CONVENTION FOR 1952 THE REGULATION OF WHALING, 1946. Fisheries Department, St. Stephen's House, Victoria Embankment, Westminster, London, S.W.1., March 1952. 19 pp. In English.

The International Whaling Convention, 1946, including amendments to the schedule made by the International Whaling Commission at its first three meetings. The amendments of the third meeting, which came into force on 18 November 1951, are underscored. An index to the schedule is appended.

FWS 2.14 WHALING — JAPAN UDC 639.245.1 (52)

Japan, Fisheries Agency. SOME MATERIALS SHOWING THE STATUS OF 1952 WHALING JAPAN (II). Published by the Japan Whaling Association, Tokyo, Japan. 19 pp., 23 fig. In English.

Gives catch statistics of sperm whales in waters adjacent to Japan from 1911 to 1951; size distribution, monthly catch, average size and production per sperm whale caught in waters adjacent to Japan and Bonin area during 1951; size distribution of blue, fin, sei and humpback whales in these waters in 1951, and size distribution of blue, fin, humpback and sperm whales caught in the Antarctic in 1952; monthly catch and size distribution of small cetaceans in waters adjacent to Japan in 1951 are also given, together with licensed catchers for these cetaceans.

FWS 9.16 FISH CULTURE UDC 639.3

Dannevig, Alf and Hansen, Sigfred. Faktorer av betydning for fiskeeg- 1952 genes og fiskeyngelens oppvekst [FACTORS INVOLVED IN HATCHING AND REARING FISH EGGS AND LARVAE]. *Reports on Norwegian Fishery and Marine Investigations* (Director of Fisheries, Bergen, Norway), Vol. 10, No. 1. A.s. John Griegs Boktrykkeri, Bergen, Norway. 36 pp., illus., tables. In Norwegian, with English summary.

Report on the results of recent experiments with the rearing of several species of salt water fishes in the Flôdevigen Sea Fish Hatchery. Herring, cod and plaice were reared in aquaria and hatching boxes to get information on the factors controlling the survival of eggs and larvae in natural waters. Experiments indicate that gas content, gas pressure, intensity of light, bacteria infection and pollution of the water with products of metabolism have great influence on the rate of survival.

Pardo García, Luis. *Acuicultura Continental* [INLAND AQUICULTURE].
1951 Colección Agrícola Salvat. Salvat Editores, S.A., Madrid, Spain.
xvi + 443 pp., 284 fig. In Spanish.

A treatise covering many aspects of aquiculture including the culture of carp, salmon and other fish, lake fisheries, ornamental fish culture, and fish pests and parasites. Also includes culture of fresh water crustaceans and mollusks, frogs, and other aquatic animals and plants including rice culture. Although mostly devoted to the study of aquiculture in Spain, including a full chapter on fish culture, this book contains considerable information on aquiculture in other countries.

Indo-Pacific Fisheries Council. *FISH CULTURE IN INDONESIA. Special*
1952 *Publications No. 2*. Indo-Pacific Fisheries Council, FAO, Maliwan
Mansion, Bangkok, Thailand. x + 126 pp., illus., plates. In
English.

Report on the seminar in brackish water fish culture held in Indonesia in April - May 1951 under the sponsorship of the Indo-Pacific Fisheries Council of FAO. Presents material used for instructing students, including reports on field work. A special section contains papers dealing with particular aspects of inland fisheries work, such as: "Breeding of Carp in Indonesia," "Occurrence of Anopheles Larvae on Rice Fields during a Combined Cultivation of Rice and Fish," "Organisms in Brackish-water Ponds with Special Reference to Plankton," "Chanos Chanos, Some Notes on its Anatomy and Physiology".